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Arthur D. Little, Inc.

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The study determines in which cases and under what circumstances it is feasible for Federally owned boilers to utilize solid waste as a supplementary fuel. The study provides the data necessary to write a guideline to aid operators of Federally owned boilers in modifying their systems to utilize solid waste as a supplementary fuel. The study examines industrial sized boilers. The modifications necessary, the solid waste preparation required and system economics.

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STUDY OF THE FEASIBILITY OF FEDERAL PROCUREMENT OF FUELS PRODUCED FROM SOLID WASTES

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GLOSSARY OF TERMS

$C_s = C_I + C_o$

C_d, disposal costs ($/ton)

C_I, capital amortization charges ($/ton)

C_o, additional operating costs (exclusive of capital amortization) ($/ton)

C_t, transfer costs ($/ton)

C_hM, transport costs ($/ton)

f, fossil fuel value ($/$10^6$ BTU)
Hw, heating value per ton of waste (10^6 BTU/ton)
I, capital cost ($)
C_L, cost of picking up waste from a transfer station and dropping off the load at the boiler site ($/ton)
C_v, cost of operating a transport vehicle on the road ($/ton mile)
M, haulage distance
E, cost of owning and operating a transport vehicle ($/hr)
L, driver - wages ($/hr)
T, tonnage (tons)
V, average over-the-road vehicle speed (miles/hr)
t, time (hrs)
P, air pollution control equipment costs ($)
F, firing time (hrs)
TPD, tons per day of refuse
$PPhl_B$, minimum boiler steam load, #/hr
D, design steam capacity (#/hr)
r, fractional firing achievable if refuse is fired at a constant rate 24 hrs/day, 365 days/yr.

POTENTIAL FOR UTILIZATION OF SOLID WASTES IN FEDERALLY OWNED BOILERS

1.0 INTRODUCTION AND BACKGROUND

1.1 PROGRAM OBJECTIVES

In October of 1974, the Office of Solid Waste Management of the U.S.E.P.A. initiated a nine month contract with Arthur D. Little, Inc. (ADL) to explore the potential for utilizing properly prepared solid waste as a supplementary fuel in Federally-owned boilers. The objectives of the program were:

1. To determine in which cases and under what circumstances it is feasible for Federally owned boilers to utilize solid waste as a supplementary fuel.

and

2. To provide the data necessary to write a guideline to aid operators of Federally owned boilers in modifying their system to utilize solid waste as a supplementary fuel.

1.2 SCOPE OF WORK

In pursuit of the program objectives, the following tasks were undertaken:

Task I - Preparation of an Inventory of Federally-owned Boilers

1. Assembly of Data

   Through contacts with individuals responsible for utility operations in various Federal agencies, an inventory of Federally-owned boilers was compiled, including to the extent possible:

   a. location
   b. agency ownership
   c. purposes for which the boilers are used
   d. load requirements
   e. basic characteristics related to refuse burning potential

2. Preliminary Assessment of the Technical Feasibility of Conversion

   On the basis of the inventory data assembled, an assessment was made of which boilers appeared to be technically capable of being converted. The assessment must be of necessity considered preliminary, pending detailed examination of engineering design blueprints.

   For the technically feasible cases identified, an estimate was made of the number of tons of solid waste per day which could be fired into the boilers if conversion were implemented.

Task II - Classification of Candidate Boilers

In preparing the inventory, boilers were classified into three generic categories:

- A. Those presently firing coal
- B. Those originally designed to fire coal, but presently firing oil or natural gas
- C. Those designed for and firing oil or natural gas

Federally-owned boilers in Category A, which encompasses most of the boilers technically capable of being converted, are of two types - (1) small stoker-fired boilers in the range of 5,000-250,000 lb/hr., used primarily for heating, and (2) large pulverized coal fired TVA boilers in the 600,000 - 6,000,000 lb/hr. range used primarily for generation of electricity.

For the stoker fired boilers, three types of refuse were considered:

Type I - source segregated and shredded paper and plastics
Type II - shredded and magnetically separated municipal type solid waste
Type III - shredded, air classified, size and moisture reduced prepared solid waste fuel

For the pulverized coal boilers only Type III waste was considered.

Task III - Economics of Boiler Conversion and Operation

1. Development of an Analytical Framework

   The economic benefits of utilizing solid waste as a supplementary fuel may be defined as the difference between dollar savings (due to the value of the fossil fuel displaced and the waste disposal costs foregone), and dollar costs (due to bringing about the conversion and subsequently operating the system).

2. Estimation of Costs of Conversion

   For each technically feasible class of boiler/refuse type combinations, estimates were made of the capital investment requirements for each of the major components of a solid waste boiler conversion system - receiving and preparation; storage; and refuse burning.

3. Estimation of Operating Costs

   Estimates were made of the major operating cost components associated with the utilization of solid waste as a supplementary fuel. These components include: capital amortization; maintenance; labor; electricity; transfer and haulage (when off-site wastes are brought in); and in the case of Type III systems, fuel purchase.

4. Estimates of Potential Savings

   From disposal cost data and fossil fuel values supplied by the Federal facilities, or estimated, the magnitude of the potential dollar savings, if conversion were implemented, was calculated.

Task IV - Availability of Refuse as Supplementary Fuel for Boilers Capable of Being Converted

Estimates were made on the basis of waste generation data supplied or population statistics, of the supplementary fuel available from the following sources:

1. The facility served by the boiler
2. Other Federal facilities within 50 miles of the potentially convertible boiler
3. Municipalities within 25 miles of the potentially convertible boiler

The available wastes were then matched against the boiler load requirements.

1.3 SOLID WASTE AS A SOURCE OF FUEL

The threat of increased costs or absolute shortages of fossil fuels, combined with the growing costs and increasing nuisance of solid waste disposal, have enhanced the attactiveness of recovering energy from solid wastes.

1.3.1 Energy Recovery Demonstrations

The burning of refuse to produce steam is not a new concept. It is well-established practice in the lumber, pulp and paper, furniture and millwork industries, which generate large quantities of wood wastes, and in cane sugar mills, which generate large quantities of bagasse. In Europe, particularly in Germany and France, heat recovery incineration has been practiced successfully for many years. In the U. S. as early as 1962, at the Naval Public Works Center in Norfolk, Virginia, an impending waste disposal problem and a projected need for additional steam generating capacity, stimulated design and construction of two 180TPD water wall incinerators with a steam generating capacity of 50,000 lb/hr. They have now been in operation since 1967, and a second facility is planned for the Naval Shipyard in Portsmouth, Virginia.

The success of the water wall incinerator in Norfolk may be due in part to the existence of a captive customer for the steam generated. Several U. S. communities, such as Chicago, Illinois and Braintree, Massachusetts, also currently operate large steam generating incinerators, but the steam has not, in fact, been sold to potential users because of contractual or operational difficulties. Quite generally, the problems communities face in obtaining long term committments from energy users has been a major barrier to the successful implementation of the water wall incinerator approach.

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Most of the energy recovery systems in existence have been designed specifically to handle solid wastes, with or without a supplementary fossil fuel. There has been some reluctance to adapt existing fossil fuel boilers for the use of solid waste as a supplementary fuel. The importance placed on reliability in utility boilers, and to some extent in industrial boilers as well, mitigates against the use of a new type of fuel when unforeseen problems could force unexpected and costly interruptions in service. There is probably no better way to overcome this reluctance than a few full-scale, well-publicized successful demonstrations.

In 1972, municipal solid waste (MSW) was successfully accommodated as a supplementary fuel in an existing utility boiler. Union Electric and Combustion Engineering, in cooperation with the city of St. Louis and the U. S. Environmental Protection Agency, are using prepared domestic refuse to supply 10% of the fuel requirements in the Meramac No. 1 boiler, a 125 MW tangentially fired pulverized coal unit. The MSW is shredded, magnetically separated, and air classified to separate the non ferrous and inert fraction from the light combustible fraction, which is fired into the boiler.

Successful demonstration of solid waste firing in existing Federally-owned boilers would not only provide a tangible demonstration of feasibility to the private sector, but would also create a working expertise within the Federal government,from which the private sector might derive information on the technical and economic problems and benefits of conversion. The only Federally-owned boilers comparable to Union Electric's Meramac No. 1 are those under the jurisdiction of TVA. Most of the Federally-owned boilers capable of burning a solid fuel are rather small stoker-fired units, currently used to supply steam for processing and heating purposes. Successful use of solid waste in these boilers could open up untapped opportunities for energy recovery, adding to existing heat recovery incineration and demonstrated utility boiler applications.

1.3.2 Heating Values of Solid Waste and Fossil Fuels

The heating value of solid waste prepared for use as a fuel, compares very favorably with the heating values of many conventional fuels, although the heterogeneous and imprecisely known composition of refuse makes it somewhat difficult to predict its burning characteristics exactly. In the context of this program, we have considered three types of solid waste fuel -source segregated waste paper, cardboard and plastic; mixed municipal refuse, and an air classified shredded waste derived fuel. Typical compositions for each of these types of fuel are given in Table 1.3-1.

The primary constituent in each type of fuel is paper, which has a higher heating value (when dry) of about 7500 Btu/pound. The heating value of the solid waste fuels depends upon the specific composition and also upon the ash and moisture content, but it typically will fall in the range shown below.

Range of Higher Heating Values for Solid Waste Fuels

	Range (Btu/lb)	Average (Btu/lb)
Source Segregated Paper	7000-8000	7500
Mixed Municipal Refuse	4000-5000	4500
Air Classified, Shredded Fuel	6500-7500	7000

Source: ADL estimates

These numbers are to be compared to the heating values of more conventional fuels shown in Table 1.3-2. Peat is seen to have a lower heating value than solid waste. Wood is comparable in heating value to mixed municipal refuse, and lignite has about the same heating value as air classified shredded fuel and a lower heating value than source segregated paper.

TYPICAL COMPOSITON OF REFUSE BASED FUELS, WT %

	Source Segregated	Mixed Municipal Refuse[1]	Air Classified Shredded Fuel
Paper	95	43	51
Lumber	--	5	6
Textiles,Leather,&Rubber	--	3	4
Plastics	5	3	4
Food Wastes	--	15	18
Yard Wastes	--	11	13
Ferrous Metals	--	7	--
Non-ferrous Metals	--	2	--
Glass	--	9	3
Miscellaneous(dirt, etc.)	--	2	1
TOTAL	100	100	100

[1] Percentage of wet refuse "as received"

SOURCE: ADL estimates

TABLE 1.3-1

HEAT CONTENT OF CONVENTIONAL FUELS

Peat	Higher Heating Values (in Btu/lb)
Peat	3,235
Wood	4,690
Lignite	7,065
Sub-bituminous B	10,245
Anthractie	11,100
Bituminous - Hi Volatile B	12,235
Bituminous - Volatile	14,460
#6 Fuel Oil	18,265
#2 Home Heating Oil	19,565
Methane	23,895

TABLE 1.3-2

2.0 INVENTORY OF FEDERALLY OWNED BOILERS

2.1 INTRODUCTION

A tabular inventory of the Federally-owned boilers identified during the course of this program is presented in Appendix I. The boilers are listed by state, and are subdivided within each state into three categories as follows:

A. Facilities currently burning coal
B. Facilities originally designed for coal, but currently burning oil or natural gas
C. Facilities designed for and currently burning oil or natural gas

It may be anticipated as a first approximation, that the technical feasibility of using solid waste as a supplementary fuel is greatest in category A boilers which are already equipped to burn solids and which have ash handling capability. The technical feasibility of converting category B boilers to solid fuel (either coal or solid waste) might be expected to vary, depending upon the extent of the modifications that were made when coal was abandoned in favor of oil or natural gas. If solids and ash handling facilities are still intact, reconversion for the use of solid waste as a supplementary fuel should be technically only slightly more difficult for category B than for category A boilers. Where ash pits have been bricked or cemented over, where grates have been removed, and where extensive modifications have been made to the boiler itself, the use of solid waste as a supplementary fuel is almost precluded. Conversion of category C boilers, which were designed to handle only liquid or gaseous fuels, would be expected to present the most difficult technical problems.

It should not be concluded from the foregoing discussion that all category A boilers and no category C boilers are technically capable of being converted. As discussed in Section 3.3, the specific boiler configuration - placement and construction of water walls, bridge walls, tubes, baffling, etc.- also has an important bearing on the technical feasibility of introducing solid waste and assuring high combustion efficiency.

2.2 INVENTORY SUMMARY

A total of 1305 Federally owned boilers were identified during the course of this program through contact with:

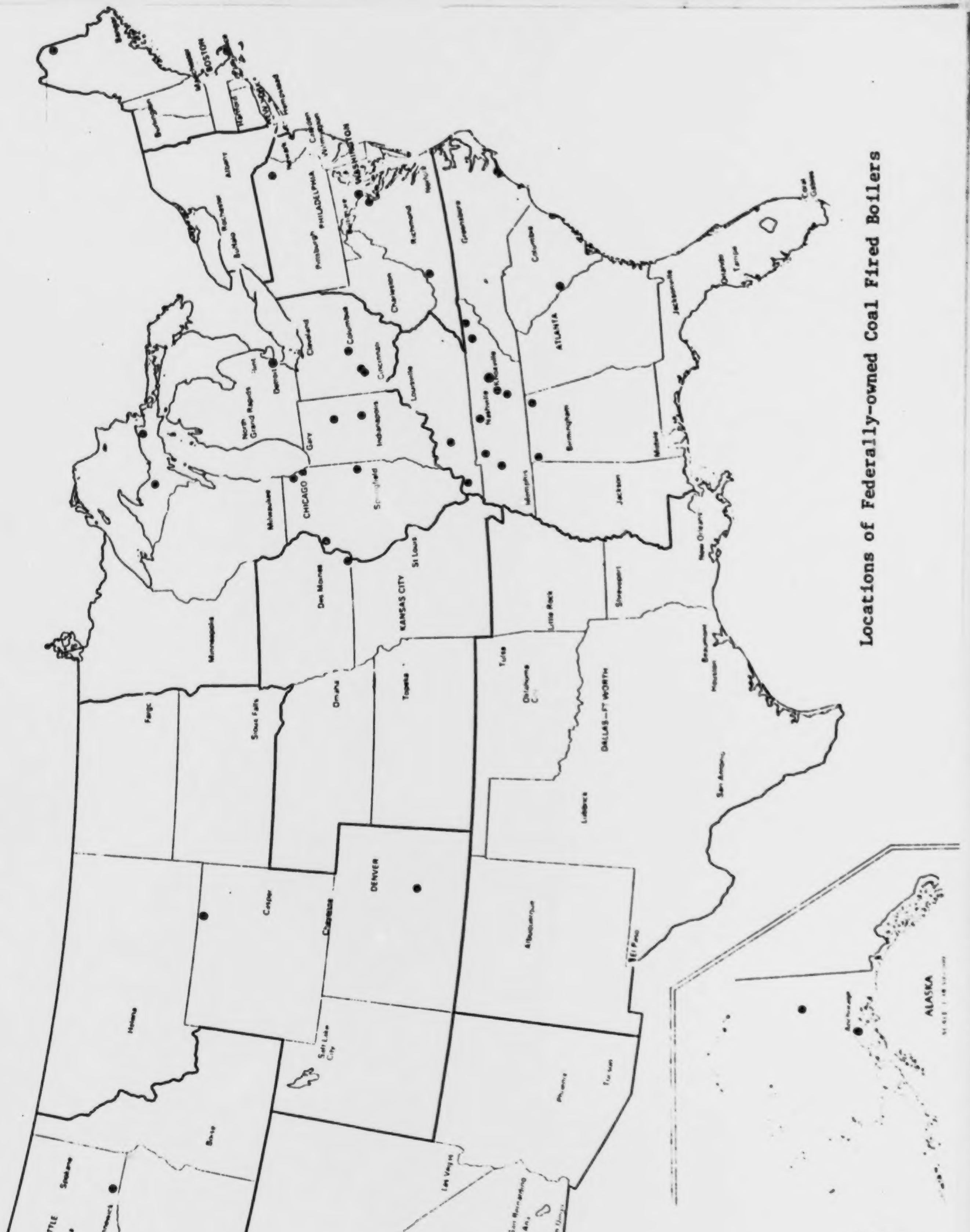
- Department of Defense
- Department of the Air Force

- Department of the Navy
- Department of the Army
- GSA, Washington
- GSA Regional Offices
- Veterans Administration
- TVA
- ERDA

A breakdown of the boilers identified is given in Table 2.3-1, by agency jurisdiction and category (as defined in section 2.1). Typically, a given installation (e.g., Wright-Patterson Air Force Base) will be equipped with more than one boiler. Since the present study represents the first attempt, to our knowledge, to assemble an inventory of Federally owned boilers, we have no way of assessing whether the information presented is complete. From discussions with people responsible for boiler operations in the various agencies contacted, we suspect that the gaps in the data base, if any, would be primarily in under-reporting of small boilers, with a capacity of less than 20,000 lb/hr.

Data on the 203 Federally-owned coal-fired boilers identified (exclusive of TVA) are summarized in Table 2.3-2. For the most part these are stoker fired boilers used in steam generation for process and heating applications. The boilers range in size from 3400 to 279,000 lb/hr., with an average of 72,800 lb/hr. and a median of 60,000 lb/hr. Over two-thirds of the boilers identified have a capacity less than 70,000 lb/hr.

The geographical distribution of Federal installations (including TVA) currently burning coal is shown in Figure 2.2-1.


BOSTON
Burlington
Albany
Rochester
Buffalo
NEW YORK
Newark
Camden
Wilmington
PHILADELPHIA
Pittsburgh
WASHINGTON
Baltimore
Richmond
Norfolk
Charleston
Greensboro
Columbia
Jacksonville
Orlando
Tampa
Coral Gables
ATLANTA
Birmingham
Mobile
Jackson
New Orleans
Memphis
Nashville
Knoxville
Louisville
Cincinnati
Columbus
Cleveland
Detroit
Flint
North Grand Rapids
Gary
Indianapolis
CHICAGO
Springfield
Milwaukee
St Louis
KANSAS CITY
Des Moines
Minneapolis
Little Rock
Shreveport
Tulsa
Oklahoma City
DALLAS—FT WORTH
Beaumont
Houston
San Antonio
Lubbock
Fargo
Sioux Falls
Omaha
Topeka
DENVER
Casper
Cheyenne
Albuquerque
El Paso
Helena
Boise
Salt Lake City
Phoenix
Tucson
Las Vegas
San Bernardino
Santa Ana
San Diego
Los Angeles
Fresno
SAN FRANCISCO
Sacramento
Reno
SEATTLE
Tacoma
Spokane
Kennewick
Portland
ALASKA
Anchorage

Locations of Federally-owned Coal Fired Boilers

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FIGURE 2.2-1
2.3

TABLE 2.3-1

NUMBER OF FEDERALLY-OWNED BOILERS BY AGENCY

	CATEGORY					
	A. Coal Burning Boilers		B. Boilers Converted from Coal		C. Boilers Designed for Oil or Natural Gas	
Agency Jurisdiction	No. of Boilers	No. of Installations	No. of Boilers	No. of Installations	No. of Boilers	No. of Installations
Air Force	70	15	8	2	189	40
Army	52	9	130	24	145	53
Navy	9	3	2	2	106	30
GSA	14	4	4	1	17	3
VA	3	1	51	11	394	122
TVA	61	11	-	-	-	-
ERDA	46	3	4	1	-	-
Total	255	46	199	41	851	248

Grand Total: 1305 boilers in 335 installations

SIZE OF FEDERALLY-OWNED COAL FIRED BOILERS (exclusive of TVA)

Total Number of Boilers: 203

Average Boiler Size: 72,800 lb/hr.

Range: 3400-279,000 lb/hr.

Size Distribution	Number of Boilers	%
<10,000 lb/hr.	14	7
>10,000 - 20,000	22	34
>20,000 - 30,000	16	
>30,000 - 40,000	32	
>40,000 - 50,000	11	21
>50,000 - 60,000	26	
>60,000 - 70,000	6	
>70,000 - 80,000	18	15
>80,000 - 90,000	3	
>90,000 - 100,000	9	
>100,000 - 150,000	28	23
>150,000 - 200,000	3	
>200,000	15	

TABLE 2.3-2

3.0 ASSESSMENT OF POTENTIAL FEASIBILITY OF CONVERSION

A preliminary analysis of the feasibility of conversion to solid waste is presented in Section 3.1 for the coal-burning Federal installations identified. The analysis is based primarily on the comparative costs of two options: (1) disposal of the wastes by conventional means and (2) utilization of the wastes as fuel. Costs were calculated on the assumption that 50% of minimum (usually summer) load would be supplied by solid wastes. The sensitivity of the results to the assumptions made is discussed in Section 3.2. Boiler-specific considerations, which would have to be taken into account in subsequent engineering design, are discussed in Section 3.3.

3.1 ECONOMICS OF CONVERTING COAL FIRED BOILERS

3.1.1 ANALYTICAL FRAMEWORK

In defining economic criteria of feasibility, it is important to draw the boundary within which the economic analysis is made to include all important economic effects. In this case, the boundary must include, in addition to the boiler facility, the source of the waste and the alternative means of disposal of that waste if it is not utilized as boiler fuel. Within this boundary, the principal economic factors to be considered are:

1. The capital cost of modifying the boiler and establishing a waste preparation facility.
2. The operating costs of the waste preparation facility and the added operating costs for firing the waste fuel into the boiler and handling the resulting ash.
3. The amortization of the capital charges, specifically the amortization period and interest rate.
4. The value of the fossil fuel (coal, gas, or oil) saved by burning waste.
5. The cost of transporting the waste from the point of generation to the boiler.
6. The cost of disposing of the waste which is avoided by utilizing the waste as boiler fuel.

Figure 3.1.1-1 shows the alternative uses of waste, and defines the basic economic elements identified above. If the waste is disposed of by conventional means (Option 1), the cost is:

$$C_1 = C_d \quad (\$/\text{ton})$$

Alternatively, if the waste is utilized as boiler fuel (Option 2), the cost is:

$$C_2 = C_I + C_o + C_t + C_h M - fHw$$

ALTERNATIVE USES OF WASTE

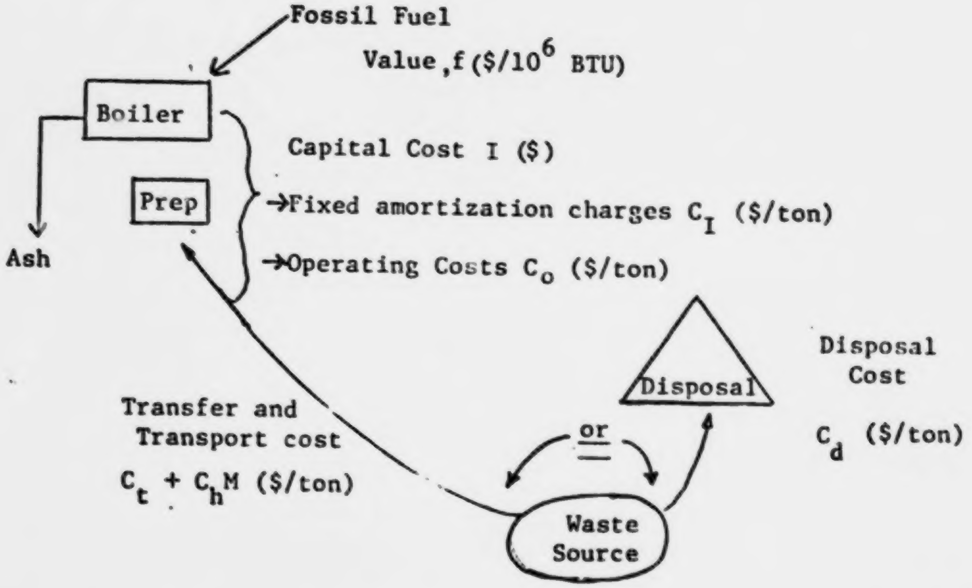

Fossil Fuel
Value, f ($/10^6 BTU)
Boiler
Capital Cost I ($)
Prep
→Fixed amortization charges C_I ($/ton)
Ash
→Operating Costs C_o ($/ton)
Disposal
Disposal Cost
C_d ($/ton)
Transfer and Transport cost
$C_t + C_h M$ ($/ton)
or
Waste Source

FIGURE 3.1.1-1

where:

C_I fixed amortization charges associated with the capital cost of boiler modification and waste preparation

Co added operating costs (labor, utilities, and maintenance) associated with waste preparation, firing and ash disposal

C_t cost of transferring the waste from local collection vehicles to transport vehicles.

C_hM cost of transporting the waste from transfer station to the facility, where C_h is the transport cost per ton mile and M is the haul distance.

fHw saving in fossil fuel costs, where f is the value of fossil fuel per million Btu and Hw is the heating value in MMBTU per ton of waste

Utilization of waste as fuel provides a net economic benefit if C_2 is less than C_1, or if

$$C_I + Co + C_t + C_hM - fHw < C_d \tag{1}$$

The methodology used for calculating each of the major cost elements in equation (1) is given in the sebsection's below.

In general, calculations were based on three types of systems, as follows:

- Type I System - Where source segregated materials, including paper and plastic wastes, are shredded and fired directly into the installation's boiler.
- Type II System - Where refuse from the installation, nearby Federal installations and/or surrounding communities is received, shredded, magnetically separated, and then fired into the existing boiler.
- Type III System - Where a refuse based fuel is directly fired into the installation's existing boiler. (Since the preparation of refuse based fuels is economically attractive on a scale of 1,000 TPD or greater, we have assumed that the federal installation will purchase the refuse based fuel from a manufacturer rather than setting up an on-site preparation plant.)

The characteristics of these three firing systems are compared in Table 3.1.1-1. The Type I system is designed to handle source segregated paper and is the simplest and smallest of the three firing systems considered. It will handle the paper and plastics generated at a given installation but will not handle such things as cafeteria wastes or other components normally found in municipal refuse. We have assumed that approximately 50% of the wastes generated at an installation would be source separable

COMPARISON OF FIRING SYSTEMS

	Type I	Type II	Type III
Waste	Source Segregated Paper	Mixed Refuse	Refuse Based Fuel
Source	Installation	Installation and Surrounding Communities	Refuse Fuel Plant
% of Installation's Waste	50%	100%	0 or 100%
Refuse Receiving & Preparation System			
Receiving Hopper	Yes	Yes	Yes
Infeed Conveyor	30" Belt	48" Belt	----
Shredder	5 tons per hour (24" x 30" inlet)	20 tons per hour (48" x 60" inlet)	None
Motor	75 hp	300 hp	None
Conveyor to Storage	24" Belt	36" Belt	Pneumatic (50 ton/hr
Building	No	Yes	No
Storage	3 days[2]	3 days	3 days or more[1]
Refuse Firing System	Pneumatic	Pneumatic	Pneumatic

[1] An installation does not have to deliver its wastes to a refuse plant in order to purchase byproduct fuel

[2] This system could be designed without storage by regulating shredder flow. Costs are lower for systems greater than about 35,000 pound per hour minimum steam demand.

TABLE 3.1.1-1

paper and plastics. The remaining portion of the wastes would have to be landfilled or disposed of using some other means. As a practical matter, source segregation is only likely to be feasible within a particular Federally owned facility. This was demonstrated at Carswell Air Force Base, for example, where purely voluntary source segregation of wastes directly associated with the installation was put into practice. If wastes from the surrounding community must be included, source segregation is unlikely to be practicable. Furthermore, the need for separate collection of non-combustibles would create some problems.

The Type II system is designed to handle all of the components found in municipal refuse. Since it does not depend on voluntary segregation, it could handle not only the installation's wastes but also wastes from nearby installations or from surrounding communities. The Type III system must handle a volume of waste equivalent to a municipal population of at least 400,000. No Federal installations generate sufficient waste to supply a refuse based fuel plant, and few, if any, could handle the total output of a plant producing refuse based fuel.

3.1.1.1 Fossil Fuel Cost Savings (fHw)

The heating values, Hw, assumed in the calculations are as follows:

System	Hw (10^6BTU/ton)
Segregated paper (Type I)	15
Municipal Solid Waste (Type II)	9
Refuse based fuel (Type III)	14

The values of fossil fuel potentially displaced (f) vary greatly in different regions of the country and for different fuel types. Recent fuel costs have also tended to be quite volatile, except for installations on long-term, fixed-price contracts. The general range of cost for 1974-75 is given below:

Fossil Fuel Displaced	Fuel Value Range ($\$/10^6$BTU)
Coal	0.61-2.77 (1.54 average)
Oil	2.06-2.75
Natural Gas	0.40-1.09

3.1.1.2 Transfer Costs (C_t) and Transportation Costs ($C_h M$)

Getting the waste to the boiler site for prepartion and use as a fuel will generally require the construction and operation at the source of a transfer station to receive, store temporarily and prepare for shipment of the waste material. The operation of the station and the transport of the waste from station to boiler site incur costs which must be considered in the economic analysis of utilization of waste as a boiler fuel. These costs are developed below.

3.1.1.2.1 Transfer Stations

Two types of transfer stations were considered. The first is based on a a hopper-compactor system which loads compacted waste into 65 cubic yard transfer trailers. This system is in use in many places handling municipal solid waste, and is generally the more economical at large capacities (above about 50 tons per day).

The second type of station is based on roll-off containers into which waste is deposited and hauled uncompacted on specially equipped vehicles. This system utilizes no dangerous machinery and so can be operated unattended, except for daily clean-up. This system is used at many industrial sites and is generally the more economical at low capacities (below 25 tons per day).

The two types of systems are diagrammed in Figure 3.1.1.2.1-1. Our estimated capital and operating costs for the two systems are given in tables 3.1.1.2.1-1 and 3.1.1.2.1-2. In each case, the systems are designed to handle twice the rated daily capacity in order to accomodate inevitable fluctuations in waste generation rate. Costs of land and any unusual site development are not included.

3.1.1.2.2 Transport

The per ton cost of hauling waste from the transfer station to the boiler site is given by

$$C = C_L + C_v(2M) \qquad (\$/\text{ton})$$

where C_L is the cost associated with picking up and dropping off the load, C_v is the cost of operating the transport vehicle on the road (in $/ton-mile), and M is the distance from transfer station to boiler site. (The term 2M appears in the equation since the return trip is also charged against the load taken).

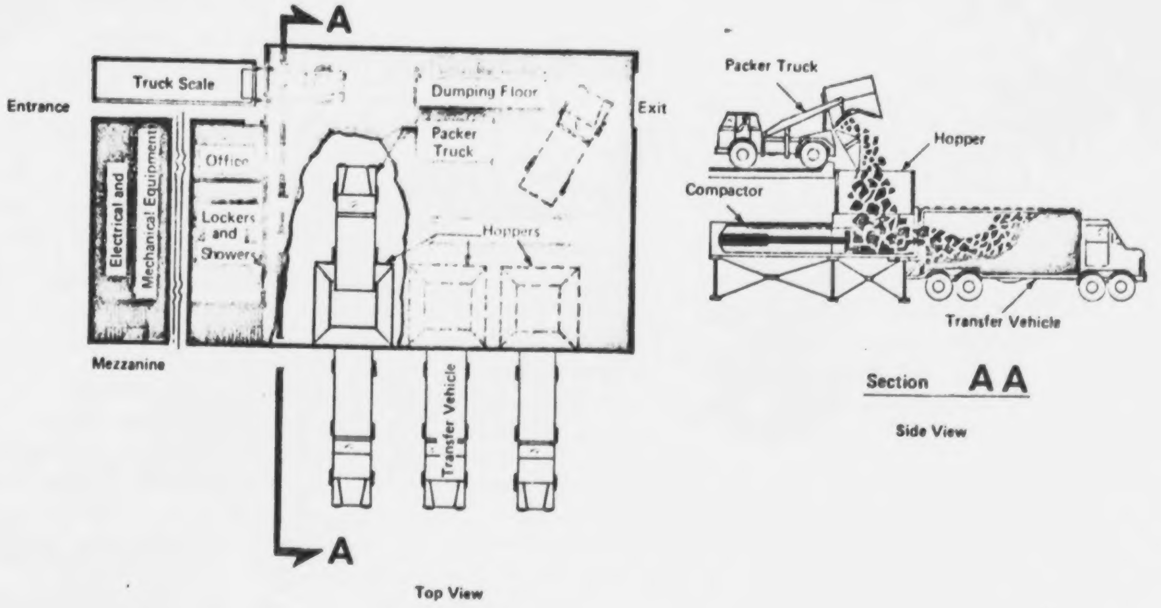
These cost factors, C_L and C_v are given by

$$C_L = \frac{(E+L)}{T}\ t \qquad (\$/\text{ton})$$

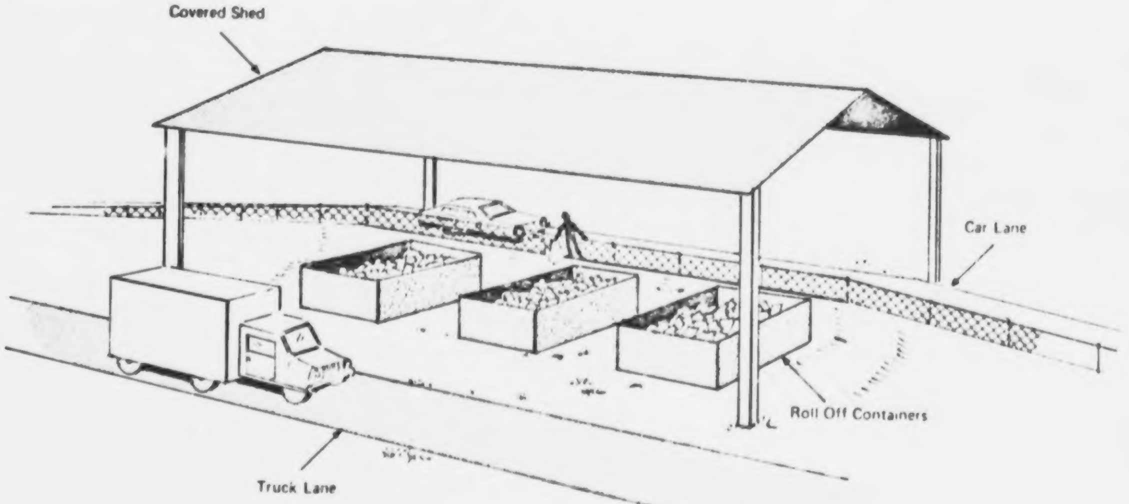
$$C_v = \frac{(E+L)}{T}\ \frac{1}{V} \qquad (\$/\text{ton-mile})$$

where E is the hourly cost of owning and operating the vehicle, L is the driver's wages, T is the tonnage carried, t is the total time required to pick up and drop off the load, and V is the average over-the-road vehicle speed.

Compacted waste is carried in 65 cubic yard tractor-trailer vehicles at a compacted density of 600 lb/cubic yard, giving a full load capacity of about 20 tons. The cost of a tractor and two trailers (one on the road, one at the transfer station) is about $60,000. Normal operating life is usually assumed to be 5 years at a 90% use factor, so that the total operating life of the vehicle is 5 x 2080 x 0.9 = 9360 hours. Equipment amortizations therefore amount to 60,000/9360 or $6.41/hour. Operating costs are about $2.50/hour, giving a total hourly equipment cost of $8.91/hour. Driver's wages are taken to be $6/hour.


A
Truck Scale
Entrance
Dumping Floor
Exit
Packer Truck
Office
Electrical and
Mechanical Equipment
Lockers and Showers
Hoppers
Mezzanine
Transfer Vehicle
A
Top View
Packer Truck
Hopper
Compactor
Transfer Vehicle
Section AA
Side View

TYPICAL MANNED TRUCK TRANSFER STATION


Covered Shed
Car Lane
Roll Off Containers
Truck Lane

TYPICAL UNMANNED TRANSFER STATION

Figure 3.1.1.2.1-1

COST OF TRANSFER STATIONS
WITH COMPACTION OF WASTE

Capacity (TPD)	25	50	100	200	500	1000
Capital Cost ($1000)	100	130	200	220	375	515
Operating Costs ($/ton)						
1. Direct Labor and Overload	2.26	1.13	1.13	0.85	0.46	0.34
2. Utilities	0.37	0.30	0.25	0.20	0.10	0.08
3. Maintenance[a.]	0.46	0.30	0.23	0.13	0.09	0.06
4. Insurance[b.]	0.15	0.10	0.08	0.04	0.03	0.02
5. Capital Charges[c.]	1.57	1.03	0.78	0.43	0.29	0.20
	4.81	2.86	2.47	1.65	0.97	0.70

a. 3% of fixed capital investment per year

b. 1% of fixed capital investment per year

c. Based on payout of capital investment over 20 years at 8% interest

Source: A. D. Little, Inc. estimates

TABLE 3.1.1.2.1-1

COST OF TRANSFER STATIONS

WITHOUT COMPACTION OF WASTE

Capacity (TPD)	3	6	9	12	24	48
Capital Cost ($1000)	19.5	29.1	38.7	48.3	86.7	163.5
Operating Cost ($/ton)						
1. Labor	2.00	1.00	1.00	1.00	1.00	1.00
2. Capital Charges[a.]	3.12	2.47	2.26	2.15	1.99	1.91
3. Maint. & Ins.[b.]	0.63	0.56	0.50	0.46	0.42	0.39
	5.75	4.03	3.76	3.61	3.41	3.30

a. Based on payout of capital investment for equipment over 5 years at 8% interest and for buildings and site over 20 years at 8% interest.

b. 3% of fixed capital investment per year.

Source: A. D. Little, Inc. estimates.

TABLE 3.1.1.2.1-2

Assuming an average over-the-road speed of 30 miles/hour and a total pick-up and drop time of 30 minutes, the cost factors in the preceding equation are:

$E = \$8.91/\text{hr.}$
$L = \$6.00/\text{hr.}$
$T = 20$ tons
$t = 0.5$ hours
$V = 20$ mph

and the transport cost is:

$$C = 0.37 + 0.05M \quad (\$/\text{ton}) \quad (\text{compacted waste})$$

Uncompacted waste is hauled in 40 cubic yard roll-off containers at an uncompacted density of 400 lb/cubic yard, giving a total load of 8 tons. Taking the vehicle cost to be $40,000 and the operating cost to be $2.00/hr. and assuming a total pick-up and drop time of 20 minutes, the relevant cost factors are:

$E = \$6.27/\text{hr.}$
$L = \$6.00/\text{hr.}$
$T = 8$ tons
$t = 0.33$ hours
$V = 30$ mph

Substituting into the general transport cost equations gives

$$C = 0.50 + 0.10M \quad (\text{uncompacted waste})$$

3.1.1.2.3 Total Transfer and Transportation Costs

Summing the haul costs in Section 3.1.1.2.2 and the transfer costs given in Section 3.1.1.2.1, we can calculate the total cost of moving the waste from the source to the boiler site. These costs are shown in Figure 3.1.1.2.3-1 as a function of the distance from the transfer stations to the boiler and the amount of waste handled at the transfer stations.

Comparing the costs given suggests several general guidelines in choosing between systems which compact the waste and those which do not. At capacities of 50 tons per day or greater, compaction systems are preferable regardless of the haul distance. At capacities much below 25 tons per day, the choice depends on the haul distance. At 25 tons per day, the break even distance is about 20 miles, with compacting systems being favored at longer haul distances.

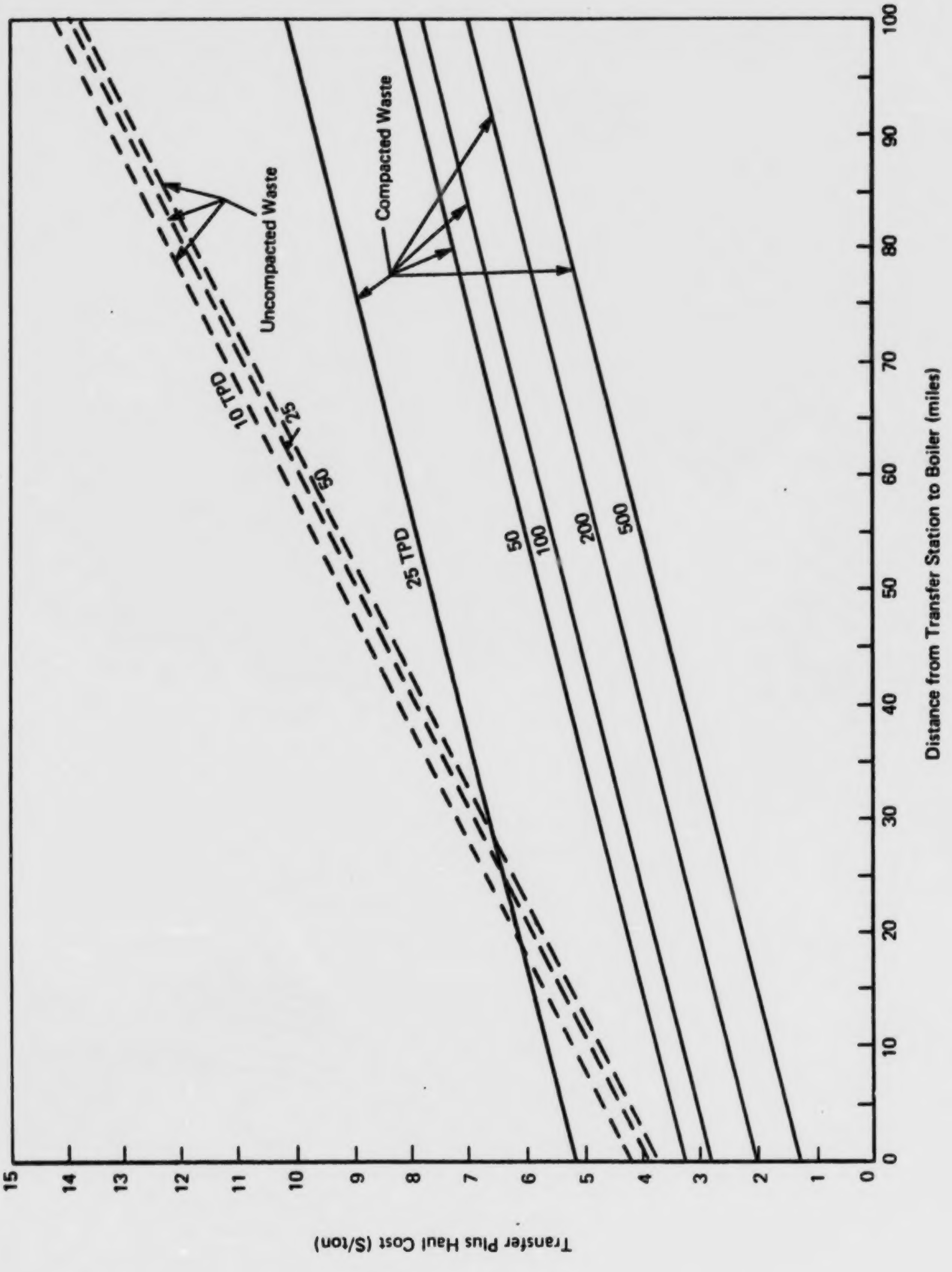


FIGURE 3.1.1.2.3-1

These cost figures are, of course, based on general assumptions. In each specific case of significant interest, more detailed engineering studies taking local conditions into account would be required to determine costs accurately and to choose properly between alternatives.

3.1.1.3 Capital Costs

The major capital cost components of a solid waste boiler conversion system are associated with: receiving and preparation; storage; and refuse firing. Each of these components is discussed in some detail below with relation to Type I, Type II, and Type III systems as defined in Section 3.1 above.

3.1.1.3.1 Receiving and Preparation System Costs

The receiving and preparation system for Type I and Type II facilities includes a refuse receiving hopper, an infeed conveyor to the shredder, the shredder itself, an outfeed conveyor, and all necessary couplings and motors. Capital costs are summarized in Table 3.1.1.3.1-1. The primary difference in the two facilities is the physical size of the shredder. For the Type I system we have assumed that segregated paper and plastics could be adequately handled using a shredder having an opening of 24 by 30 inches. A shredder of this physical size has a capacity of about five tons per hour. The Type II system requires a much bigger opening to handle the physical size of the materials that are expected to be received. For example, a large bag of trash is typically over three feet in diameter. We therefore have assumed that a shredder inlet opening of 48 by 60 inches will be required. A shredder of this size has a capacity of about 20 tons per hour.

For the systems described in Table 3.1.1-1, the maximum refuse capacity is 40,000 tons per year and 160,000 tons per year for Type I and Type II respectively. Both systems have considerably more capacity than would be required for almost all of the Federal installations surveyed as part of this work. We have, therefore, assumed that these systems would be operated only a few hours per day as needed to prepare the facility's refuse for firing.

The Type III system is simpler than either Type I or Type II because the shredder is not required. In this case, a refuse based fuel is assumed to be delivered directly to the installation where it is directed into a storage bin similar to the ones used for Type I and Type II systems.

3.1.1.3.2 Storage

Storage of a prepared refuse has proved to be a very difficult materials handling problem. In the EPA St. Louis project several bridging problems with the refuse developed so that live bottom bins with extremely high starting torque were required. Because of this and the fact that refuse has a very low packing density, the cost for storage is one of the major costs of a refuse firing system. In Figure 3.1.1.3.2-1 we have shown the

CAPITAL COST OF STORAGE BINS FOR REFUSE BASED FUELS

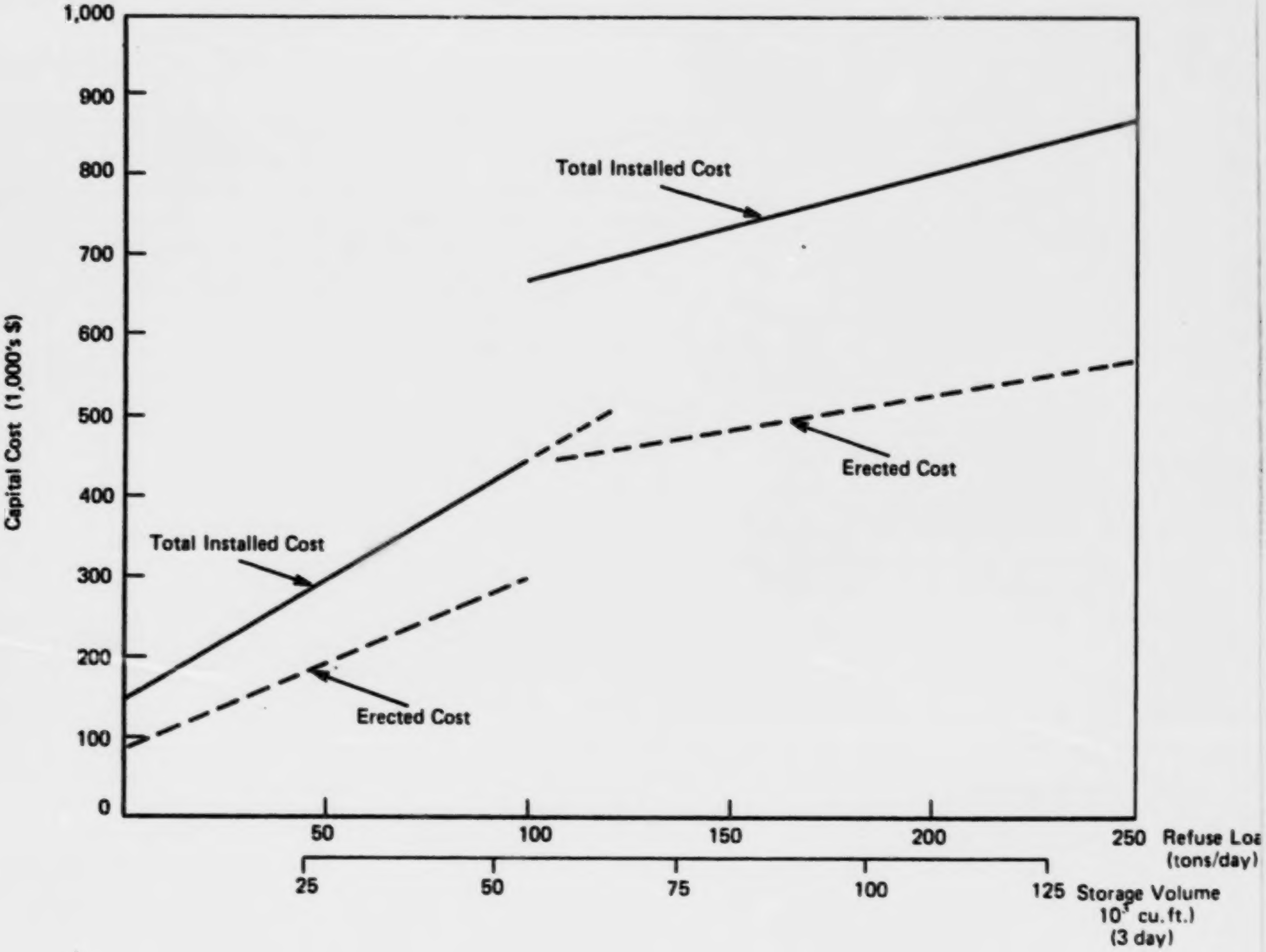


FIGURE 3.1.1.3.2-1

CAPITAL INVESTMENT FOR REFUSE RECEIVING AND PREPARATION FACILITIES

	Type I	Type II	Type III
Equipment Cost (EC)			
Receiving Hopper	1,500	8,000	10,000
Infeed Conveyor	9,000	34,500	22,300
Shredder	10,000	45,000	--
Motor & Coupling	1,300	9,200	--
Outfeed Conveyor	12,000	19,300	--
Magnetic Separator	--	10,000	--
Conveyor & Metal Storage	--	9,000	--
Total EC	33,800	135,000	32,300
Freight @ 5% of EC	1,700	6,700	1,600
Installation @ 50% of EC	17,000	67,500	16,100
Installed Equipment	52,500	209,200	50,000
Building and Site Work	--	151,300	--
Total Direct Cost (DC)	52,500	360,500	50,000
Engineering @ 10% of DC	5,300	36,000	5,000
Contractor's Fee @ 8% of DC	4,200	28,800	4,000
Contingency @ 15% of DC	7,900	54,100	7,500
Total Fixed Capital Investment	69,900	479,400	66,500

TABLE 3.1.1.3.1-1

cost of three days storage as a function of delivered refuse load, (volume as proportional to required storage discussed below). The break in the curve is the result of differing structural requirements for two major designs. In almost all of the Type I refuse firing systems a storage capacity in excess of 50,000 cubic feet will not be required. For Type II firing systems handling more than approximately 100 tons per day, the costs are determined from the upper curve shown in the figure.

For both Type I and Type II systems, three days of storage is generally considered adequate. The abscissa in Figure 3.1.1.3.2-1 can be converted to necessary volume of storage from the following relation:
(Storage volume) = (TPD fired) x 3 days of storage) x (2,000 lbs/ton)/ 11 lbs/cu ft packing density). A refuse packing density of 11 lbs/cu ft was used in this calculation, based upon experience at the EPA demonstration project in St. Louis.

The storage costs for the Type III firing system are determined in the same manner as for Type I and Type II systems. In this case, however, since the refuse is not processed on the installation itself, it may be desirable to install more than just three days of storage capacity.

To illustrate both the cost estimation procedure and the sensitivity of costs to the number of days allowed for, consider a plant firing 100 TPD of refuse. A Type I or Type II facility will require about 55,000 cubic feet of storage at a cost of almost $670,000. (According to the data in Figure 3.1.1.3.2-1 , a storage bin of this size could be built for only $450,000 using the design represented by the lower curve. However, considerable structural problems would be anticipated if the design represented by the higher curve were not used.) A Type III facility would require between 55,000 and 91,000 cubic feet of storage depending upon whether three or five days are required. The costs would be between $670,000 and $760,000 respectively.

3.1.1.3.3 Refuse Firing System Costs - Stoker Firing

The refuse firing system for a Type I system requires a pneumatic conveyer of approximately 200 feet from storage to the boiler, the addition of two or more refuse distributors to distribute the refuse evenly across the boiler grate, and the addition of an overfire air system. The addition of a stoker or other ash handling equipment is considered later.

The major factor in designing a pneumatic fuel conveyor system is the abrasive character of the transported fuel. Hence, the Type I and Type III systems are the same, since a properly air classified fuel is similar to source segregated shredded paper. In this regard, however, one of the primary difficulties encountered in the St. Louis demonstration was the rapid erosion of pneumatic conveying system elbows because of the abrasive nature of the prepared fuel. The refuse firing system for Type II wastes should be fabricated from heavier materials of construction because of the added abrasion characteristics due to the presence of glass and metals in the wastes.

CAPITAL INVESTMENT COST FOR REFUSE FIRING SYSTEM (Stoker Firing)

	Type I	Type II	Type III
Conveyor from Storage to Boiler			
Pneumatic Conveyor	27,800	37,100	27,800
Installation	9,200	9,200	9,200
Total	37,000	46,300	37,000
Boiler Firing System			
Distributors	38,500	51,000	15,000
Installation	8,200	8,200	7,500
Total	46,700	59,200	22,500
Overfire Air System			
Ducting & Controls	18,000	18,000	--
Installation	16,000	16,000	--
Total	34,000	34,000	--
Total Direct Cost (DC)	117,700	139,500	59,500
Engineering @ 10% DC	11,800	14,000	6,000
Contractor's Fee @ 8% DC	9,400	11,200	4,800
Contingency @ 15% DC	17,600	20,900	8,900
Total System Cost	156,500	185,600	79,200

Source: ADL Estimates

TABLE 3.1.1.3.3-1

In almost all cases, the equipment required for refuse firing will be sized to allow free passage of refuse particles and will not depend on the firing rate in the range from 0 to 10 tons per hour. Since this firing range spans the range of firing rates expected at Federal installations, the refuse firing modification costs are considered to be constant, regardless of the size of the system. Typical system costs are itemized in Table 3.1.1.3.3-1. Specific refuse modification costs can be expected to vary from installation to installation, and would of course have to be determined for individual cases before proceding with engineering implementation.

3.1.1.3.4 Stoker Modification Costs

In most cases, a boiler which does not have an existing stoker will be unsuitable for conversion to refuse firing. In the case of boilers designed to burn oil or natural gas only, the high particulate loadings expected from refuse firing could cause considerable boiler tube fouling due to the narrow tube spacing generally found in these particular boilers. In boilers which at one time were designed to burn coal but which have since been converted to oil, our survey indicates that in almost all cases the stoker was removed along with the ash handling system and the coal feeding system. The problem is, therefore, not one of adding the stoker alone but of adding all of the coal feeding and ash handling equipment associated with a coal boiler. Typical costs for these additions are shown in Table 3.1.1.3.4-1. It can be seen that the cost for the stoker is only about 30% of the modification costs that could be incurred if the boiler had to be retrofitted to handle a high ash content fuel. In most cases the added expense makes refuse firing prohibitively expensive. However, there are special cases where reconversion of boilers to solid fuel firing (refuse and/or coal) could be considered as economically viable. A specific case in point is that of the work currently going on at Fort Monmouth,New Jersey.

3.1.1.3.5 Air Pollution Control Costs

Many of the boilers in Federal installations do not have air pollution control equipment. If the boiler were to be converted to fire refuse based fuel, a pollution control device such as an electrostatic precipitator would be required. For the purposes of this work we have estimated the installed precipitator costs from the following relationship:

$$P(\$) = 61.3\ (\text{lbs/hr})^{0.72}$$

where (lbs/hr) is the design capacity of the boiler.

The operating costs for the air pollution control equipment including maintenance, and power costs can be calculated from the following factors:

Maintenance - 2% of capital investment per year
Power - $0.01 per 1000 lbs of steam per year

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COAL FEEDING, STOKER, AND ASH HANDLING COSTS

Boiler Size (1000's lbs/hr)	50	100	200
Equipment			
Coal Feeding	21,000	31,800	48,400
Stoker	87,000	140,000	230,000
Ash Handling	33,200	53,500	87,800
Total Equipment Cost	141,200	225,300	366,200
Freight @ 5%	7,100	11,300	18,300
Installation @ 50%	70,600	112,700	183,100
Total Direct Costs (DC)	218,900	349,300	567,600
Engineering @ 10% of DC	21,900	34,900	56,800
Contractor's Fee @ 8% of DC	17,500	27,900	45,400
Contingency @ 15% of DC	32,800	52,400	85,100
Total	291,100	464,500	754,900

Source: ADL Estimates

TABLE 3.1.1.3.4-1

The costs are applicable only to those installations that would not require air pollution control devices except in the case where combined firing of refuse and conventional fuel is adopted.

3.1.1.3.6 Capital Cost Summary

A summary of the general capital cost requirements for handling Type I, Type II or Type III wastes in stoker fired boilers is given in Table 3.1.1.3.6-1. These are of course not suitable for engineering design calculations, but should provide a ball-park estimate of the costs that might be expected.

For tangentially or horizontally fired pulverized coal boilers, which are found only at TVA installations among the Federally owned boilers, a Type III system would have to be used. Technical and economic conversion criteria specifically applicable to TVA units are discussed in Section 3.1.1.7

3.1.1.4 Operating Costs

The operating cost components of a converted boiler system include: capital amortization, labor, electricity, and maintenance. These costs were estimated for Type I, II and III systems (stoker fired) based on the following assumptions:

- Amortization - 8% for ten years
- Electric power - $0.025 per Kwh
- Maintenance - 2% of equipment modification costs
- Operating labor - $5.00 per hour
- Labor overhead - 20% of labor costs
- Administrative overhead - 50% of labor costs

Results of estimates for each operating cost component are given in the following subsections.

3.1.1.4.1 Labor Costs

Each of the three refuse systems includes a receiving and preparation area and a storage and firing area. The estimated number of operators required for each of these areas is shown in Table 3.1.1.4.1-1. On both the Type I and Type II systems two operators will be required for safety reasons in operating the shredder. Since the Type I shredder has a maximum capacity of five tons per hour and the Type II system has a maximum capacity of twenty tons per hour, we have assumed the labor requirements to be 0.4 manhours per ton and 0.1 manhours per ton respectively. We have assumed that whenever the shredder is not in operation, the two operators could be gainfully employed somewhere else on the installation.

The labor requirements for operating the storage and firing portions of the refuse firing system depend upon the number of hours per year that

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SUMMARY OF ESTIMATING EQUATIONS FOR CAPITAL COST OF REFUSE FIRING SYSTEMS

Capital Costs	Firing System		
	Type I	Type II	Type III
Receiving and Preparation	69,900	479,400	66,500 up to 500 TPD 133,000 over 500 TPD
Storage			
Up to 100 tons per day	153,000 + 2,924 (TPD)	153,000 + 2,924 (TPD)	153,000 + 2,924 (TPD)
100 tons per day or more	536,000 + 1,337 (TPD)	536,000 + 1,337 (TPD)	536,000 + 1,337 (TPD)
Refuse Firing	156,500	185,600	79,200 up to 250 TPD 158,400 over 250 TPD
Stoker Modification			
-Adjustment	2,500	2,500	--
-Replacement	185 (Boiler capacity)$^{0.68}$	185 (Boiler capacity)$^{0.68}$	185 (Boiler capacity)$^{0.68}$
Air Pollution Control	61.3 (Boiler capacity)$^{0.72}$	61.3 (Boiler capacity)$^{0.72}$	61.3 (Boiler capacity)$^{0.72}$

TABLE 3.1.1.3.6-1

this system must be operated. This in turn depends upon the steam demand at the facility. The costs could be as high as a maximum of $68,000 per year based upon a total of 8,000 operating hours at $5.00 per hour plus 20% labor overhead and 50% administrative overhead. The actual costs are determined by prorating the $68,000 to reflect the ratio of available refuse to the amount of refuse that could be fired at maximum capacity. For example, a boiler with a minimum steam load of 30,000 pounds per hour could fire up to two tons of refuse per hour at a maximum firing rate of 50% of the boiler load. If the installation has available approximately 24 tons of refuse per day, then this facility would be firing approximately 50% of the time (24 tons ÷ 48 tons per day maximum) and the yearly labor costs would, therefore, be $34,000. This method of calculation has been used for both the Type II and Type III systems, although other options are obviously possible. We have assumed that because the Type I system is relatively small and in almost all cases in close proximity to the boiler house, no additional labor would be required to monitor the refuse firing system in this case. The boiler operators currently on duty could pick up this assignment as an additional duty. On the other hand, the Type II and Type III systems are expected to be considerably larger than the Type I system so that the extra man would probably be needed.

3.1.1.4.2 Electric Power Costs

The electrical load for each of the three systems is shown in Table 3.1.1.4.2-1. In both the Type I and Type II systems the shredder is assumed to be operated at full capacity for as many hours as are required. The usage rate is determined by dividing the delivered refuse load by the shredder capacity. For the Type III system there is no shredder but rather a high capacity live bottom receiving hopper which is used to convey the incoming refuse fuel to the storage bin. The system shown in the table has a capacity of 50 tons per hour and in most cases could be operated by the truck driver who delivers the refuse fuel to the installation.

The power requirements for the storage and firing depend upon the hours per year that the boiler is fired. For the Type I system we have assumed that firing will be spread out over 16 hours rather than firing at maximum capacity. This minimizes the impact of refuse firing on any one boiler crew so that for a system this small, an additional operator will not be required for the refuse system. In the Type II system we have judged that an extra operator will be required in which case it is to the advantage of the facility to fire the refuse into the boiler at maximum capacity. Hence, the power costs for this system depend upon the actual hours per year that the system will operate and the power costs should be prorated in the same manner that labor costs were prorated. Finally, the Type III system is designed to operate around the clock, 8000 hours per year. Since the refuse based fuel is manufactured at an external facility in capacities far greater than could be consumed at any one installation, we have assumed that the facility

LABOR REQUIREMENTS

	Receiving & Preparation		Storage & Firing	
	Operators	Manhours	Operators	Manhours
FIRING SYSTEM				
Type I	2	0.4 manhr/ton	-	-
Type II	2	0.1 manhr/ton	1	duration of firing
Type III	1/2	4000 manhr/yr	1/2	4000 manhr/yr

TABLE 3.1.1.4.1-1

ELECTRICAL POWER REQUIREMENTS

FIRING SYSTEM	Receiving & Preparation		Storage & Firing	
	Installed Load	Usage	Installed Load	Usage
Type I	75 hp-hr	15 hp-hr/ton	25 hp-hr	10 hp-hr/ton[1]
Type II	300 hp-hr	15 hp-hr/ton	30 hp-hr	27 hp/hr during firing
Type III	125 hp(2)-hr	2.5 hp-hr/ton(2)	0.4 hp/TPD	8.8 hp-hr/ton(3) TPD

1 hp-hr = 0.746 kwH

---

[1] Assumes firing spread out over 16 hours

(2) Refuse fuel unloader operating at 50 tons per hour

(3) Based on 8000 hr/year

TABLE 3.1.1.4.2-1

will have no difficulty in purchasing the amount of fuel required for maximum firing. Later in this report we have explored the sensitivity of firing a Type III system with only a partial load.

3.1.1.4.3 Maintenance Costs

In all three cases we have assumed the maintenance costs to be approximately 2% of the equipment modification costs. These costs would include both the materials and labor.

3.1.1.4.4 Capital Amortization Costs

The investment cost associated with the refuse firing modifications has been amortized at an annual interest of 8% over a period of 10 years. Hence the annualized capital charge is 0.149 times the initial investment.

3.1.1.4.5 Operating Cost Summary

The operating costs for the three firing systems are summarized in Table 3.1.1.4.5-1. Both the capital amortization and the maintenance costs are based upon the capital costs of the modifications and total 0.169 times the total capital investment. The other operating costs for the firing system amount to \$4.90 per ton for the Type I system, and \$2.15 per ton plus \$9.00 per hour for the Type II system. (The total number of firing hours, F, is calculated from the following equation:

$$F = \frac{(8000\ \text{hr/yr})}{(1000\ \text{BTU/\#})} \cdot \frac{(\text{TPD})}{\dfrac{\text{PPhl}_B \cdot 50\%}{10^{6}{}_{Hw} \cdot 75\%}} \cdot \frac{1}{(24\ \text{hr/day})}$$

where:

F = Firing hours
TPD = Tons per day of available refuse
(PPhl_B) = Minimum Boiler steam load, #/hr.

This calculation is based upon a maximum refuse firing rate of 50 percent of the boiler heat input and a boiler efficiency of 75 percent. The factor F is used in calculating the operating costs of the Type II refuse firing system.) The operating costs for the Type III system are equal to \$68,000 per year plus \$.21 per ton for electric power. Power costs associated with the stoker or air pollution control device amount to less than \$.01 per 1,000 pounds of steam and, therefore, have been neglected in this operating cost analysis.

TABLE 9

SUMMARY OF ESTIMATING EQUATIONS FOR OPERATING COST OF REFUSE FIRING SYSTEMS

Operating Costs	Firing System		
	Type I	Type II	Type III
Capital Amortization 8%, 10 years	0.149 x \$ I/(TPY)	0.149 x \$ I/(TPY)	0.149 x \$ I/(TPY)
Labor Plus Overhead[1]	3.40	$0.85 + \frac{8.5 \times F}{(TPY)}$	68,000/(TPY)
Electric Power \$0.025/Kwh	0.50	$0.30 + \frac{0.50 \times F}{(TPY)}$	0.21
Maintenance 2% capital cost	0.02 x \$ I/(TPY)	0.02 x \$ I/(TPY)	0.02 x \$/(TPY)
Shredder Hammer Replacement	1.00	1.00	—

3.1.1.5 Economic Analysis Procedure

For each of the stoker fired boilers identified in the inventory, economic feasibility calculations were carried out for Type I, Type II, and Type III systems, using the basic analytical frameowrk described in Section 3.1.1 and the cost parameters developed above.

3.1.1.5.1 Type I Systems (Source Segregated Paper) - Capital and Operating Costs

In the equations presented in Table 3.1.1.5.1-1, (TPD) refers to the tons per day of wastes fired. This has been assumed to be one-half (1/2) of the wastes generated, based on the average composition of the municipal solid waste, presumably segregated.

3.1.1.5.2 Type II Systems (Shredded and Magnetically Separated Wastes)- Capital and Operating Costs

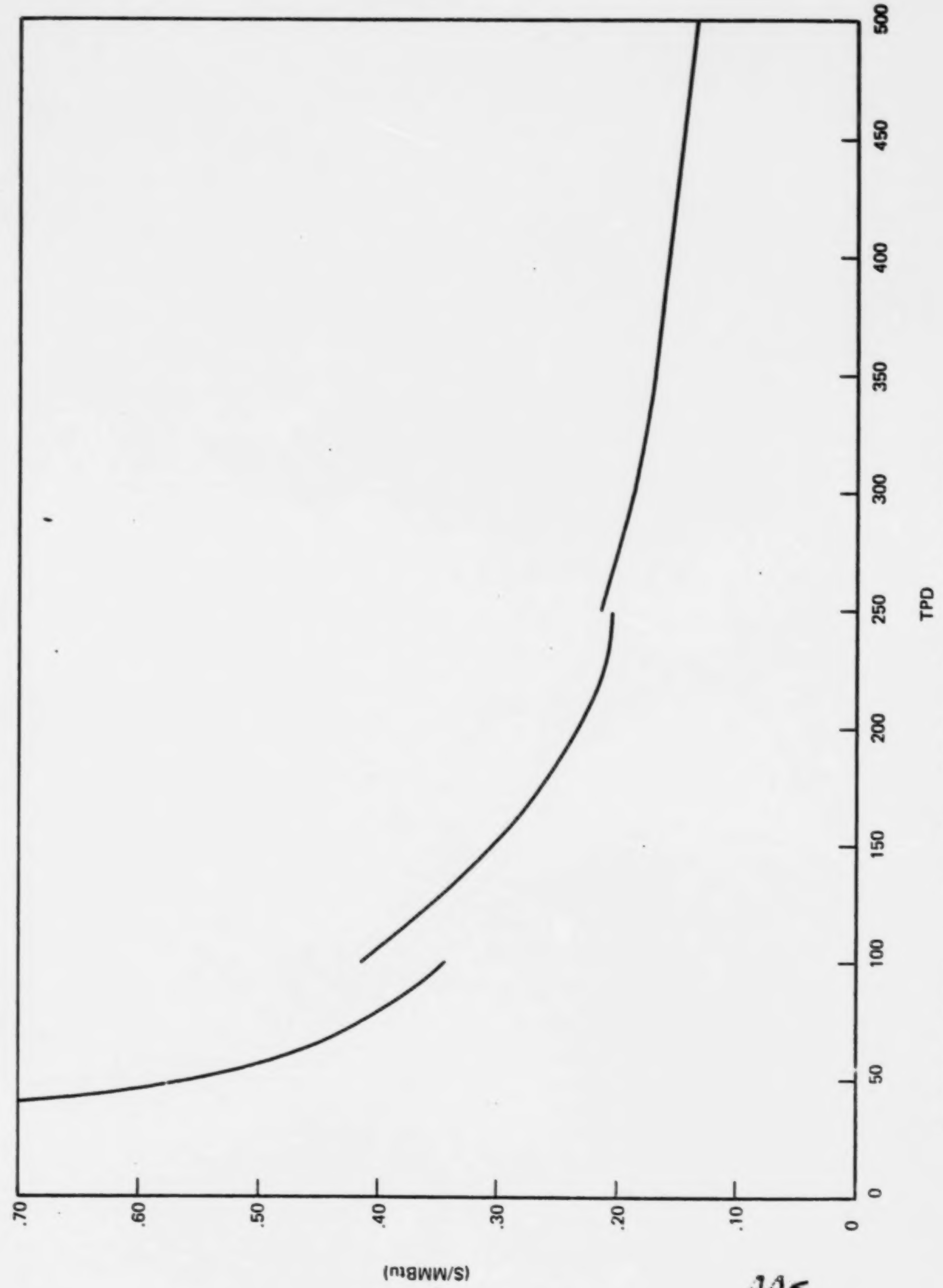
Table 3.1.1.5.2-1 provides the equations for calculating capital and operating costs of converting industrial type coal burning boilers to handle Type II solid waste as a supplementary fuel. Four cases are considered - facilities up to and over 100 TPD which have the necessary stoker and ash handling capability in working order; and facilities in the same size ranges originally designed to burn coal, but which no longer have the equipment to handle solid fuel.

3.1.1.5.3 Type III Systems - Capital and Operating Costs

Table 3.1.1.5.3-1 summarizes capital and operating costs for Type III Systems. The $14.00/ton refuse based fuel costs includes transportation and haulage. As previously indicated, Type III waste fuel cannot be economically produced in communities with a population less than about 500,000. In Figure 3.1.1.5.3-1, operating costs in $\$/10^6$ BTU (exclusive of electrostatic precipitor costs) are plotted as a function of the quantity of refuse burned in a facility. The curves suggest that a Federal facility which cannot accept more than 50 TPD of the output of a Type III waste production plant is likely to lose out to larger customers, which must be available if the plant is set up in the first place.

3.1.1.5.4 Transfer and Haulage Costs

For waste obtained from other Federal facilities, the city or the county, transfer and haulage costs must be added to the operating costs. The two values which are needed to determine transfer and haulage costs from Figure 3.1.1.5.4-1 are the distance to the boiler and the amount (in tpd) of refuse being hauled. The amount being hauled is either the total waste or a fraction of the total required to fire the boiler at 50%. Distance was calculated in one of the following ways:



Operating Costs as a Fraction of Refuse Burned - Type III System

FIGURE 3.1.1.5.3-1

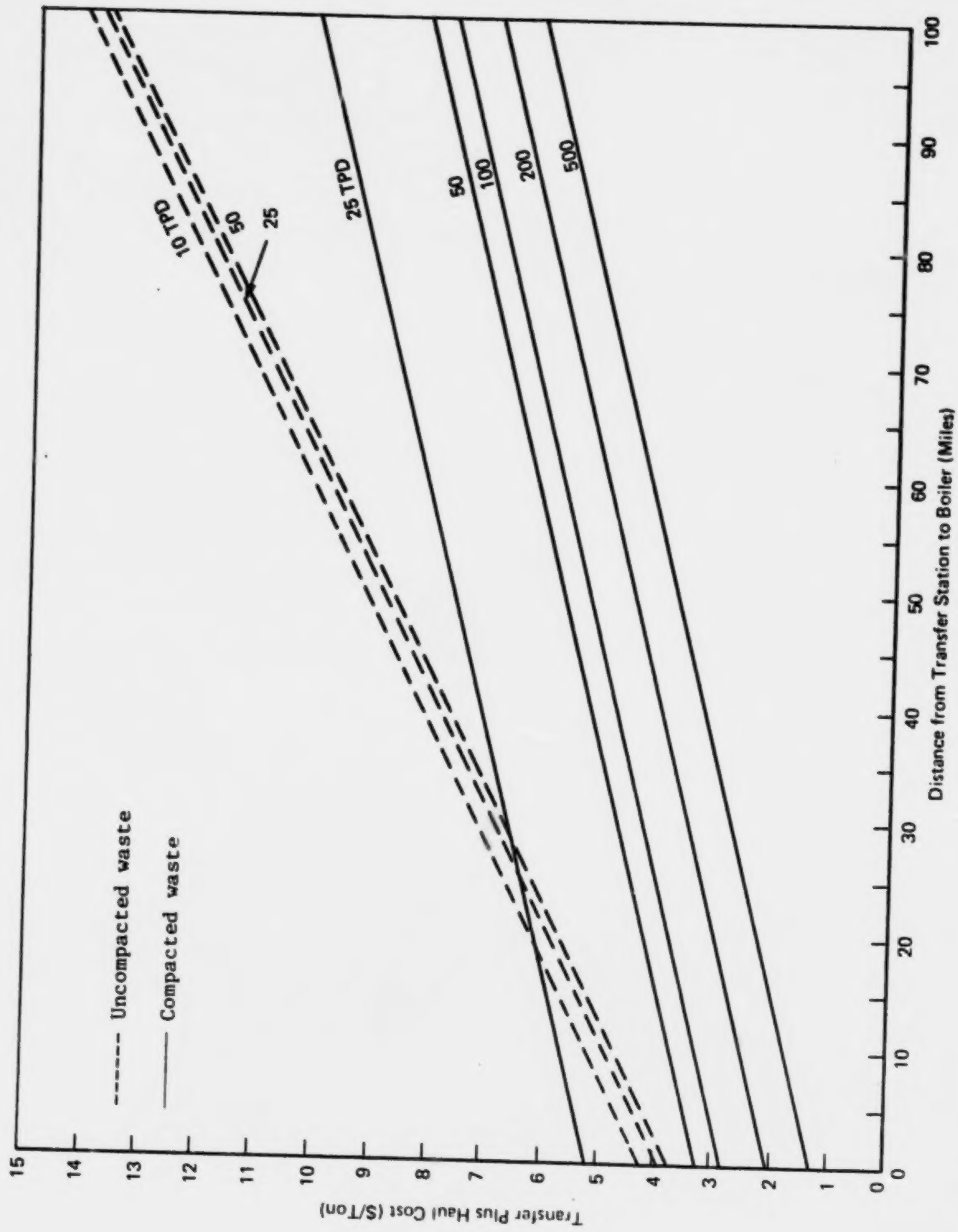


FIGURE 3.1.1.5.4-1

COST CALUCLATIONS FOR TYPE I SYSTEMS

Capital Investment ($)

$I = 379{,}400 + 2924\ (TPD)$ up to 100 TPD

$I = 762{,}400 + 1337\ (TPD)$ above 100 TPD

Op Cost $C_I + C_o$ ($/ton)

$C_I + C_o = 6.25 + 176/(TPD)$ up to 100 TPD

$C_I + C_o = 5.52 + 353/(TPD)$ over 100 TPD

If ESP is required add:

to Capital Cost ($): $(61.3)\ [D]^{0.72}$

where D = Design steam capacity in lb/hr

to Op. Cost ($/ton): $0.0283\ \dfrac{[D]^{0.72}}{(TPD)}$

TPD = tons of segregated waste fired per day

TABLE 3.1.1.5.1-1

COST CALCULATIONS FOR TYPE II SYSTEMS

A. Facilities Having the Necessary Stoker and Ash Handling Equipment

1. Up to 100 TPD

   Capital Investment ($)

   $$I = 820{,}500 + 2924(TPD)$$

   Operating Cost ($/ton)

   $$C_I + C_o = 3.50 + 380/TPD + 395\ r/(TPD)$$

2. Over 100 TPD

   Capital Investment ($)

   $$I = 1{,}203{,}500 + 1337(TPD)$$

   Operating Cost ($/ton)

   $$C_I + C_o = 2.68 + 557/(TPD) + 395\ r/(TPD)$$

B. Facilities Requiring Stoker and Ash Handling Equipment Additions

1. Up to 100 TPD

   Capital Investment ($)

   $$I = 1{,}160{,}500 + 2924(TPD)$$

   Operating Cost ($/ton)

   $$C_I + C_o = 3.50 + 537/(TPD) + 395\ r/(TPD)$$

2. Over 100 TPD

   Capital Investment ($)

   $$I = 1{,}543{,}500 + 1337(TPD)$$

   Operating Cost ($/ton)

   $$C_I + C_o = 2.68 + 715/(TPD) + 395\ r/(TPD)$$

where (TPD) = tons/day of refuse fired

r = fractional firing achievable if refuse is fired at a constant rate 24 hrs/day, 365 days/yr.

TABLE 3.1.1.5.2-1

CAPITAL AND OPERATING COSTS FOR TYPE III SYSTEMS

Up to 100 tons per day

Capital Costs: $I = 298{,}700 + 2{,}924\ (TPD)$

Operating Costs: $C_o + C_I = 324/(TPD) + 1.56$

From 100 TPD up to 250 TPD

Capital Costs: $I = 681{,}700 + 1337\ (TPD)$

Operating Costs: $C_o + C_I = 501/(TPD) + 0.83$

From 250 TPD up to 500 TPD

Capital Costs: $I = 760{,}900 + 1337\ (TPD)$

Operating Costs: $C_o + C_I = 538/(TPD) + 0.83$

Over 500 TPD

Capital Costs: $I = 827{,}400 = 1337\ (TPD)$

Operating Costs: $C_o + C_I = 569/(TPD) + 0.83$

Add to all operating costs: \$14.00/ton fuel costs

If Stoker replacement is needed add:

to capital costs: $185\ (D)^{0.68}$; D = boiler capacity, lb/hr.
to operating costs: $(0.086)\ (D)^{0.68}/(TPD)$

If ESP is needed add:

to capital costs: $61.3(D)^{0.68}$
to operating costs: $(0.028)\ (D)^{0.68}/TPD$

TABLE 3.1.1.5.3-1

1. The straight line distance from facility to major city was estimated using a state map with the two locations;
2. for a county, the distance was assumed to be 2/3 of the radius of a circle having the same area as the county;
3. for the few cases where the facility was within the city a cost of transport and hauling was taken as \$1.00/ton for a small city or as the transfer cost for large cities.

As an example, consider a facility located 30 miles from a city and requiring 100 tpd from the city. Using the graph, the transfer and haulage cost would be \$4/ton.

3.1.1.5.5 Disposal Cost Credits

If wastes are burned as fuel, disposal costs are foregone. If a facility can burn only a portion of the wastes that would have to be collected to supply 50%(or some economical fraction) of minimum load, then the wastes not burned would still have to be landfilled. Net disposal cost savings may be read off the graphs in Figures 3.1.1.5.5-1 and 3.1.1.5.5-2, which are plots of the fraction of total wastes collected that could be handled by a facility. To illustrate the use of the graphs, let us assume that a Federal installation can handle 100 TPD of solid waste in its boilers; that 20 TPD are available from the facility and 80 TPD must be obtained from the surrounding community. Assume further that the surrounding county has 200 tpd available. The two pieces of information required to estimate the disposal cost saving are: a). total waste load of the county (200 tpd) and b). fraction of waste to boiler (80 tpd needed/200 tpd available = 0.4). Thus the disposal cost savings is about \$1.95/ton.

In estimating the disposal costs for waste from two sources, a weighted averaged was used. Consider the following case:

Waste from: facility - 10 tons
city - 40 tons

Cost for disposal: facility: \$5.25/ton
city: \$3.75/ton

$$\text{Disposal Cost} = \frac{10(5.25) + 40(3.75)}{50} = \$4.05/\text{ton}$$

3.1.1.5.6 Fossil Fuel Cost Credits

The heating values per ton of waste assumed for Types I, II, and III systems are given in Section 3.1.1.1. The heating value of the fuel potentially displaced ($\$/10^6$ BTU) was obtained directly from the Federal facilities investigated.

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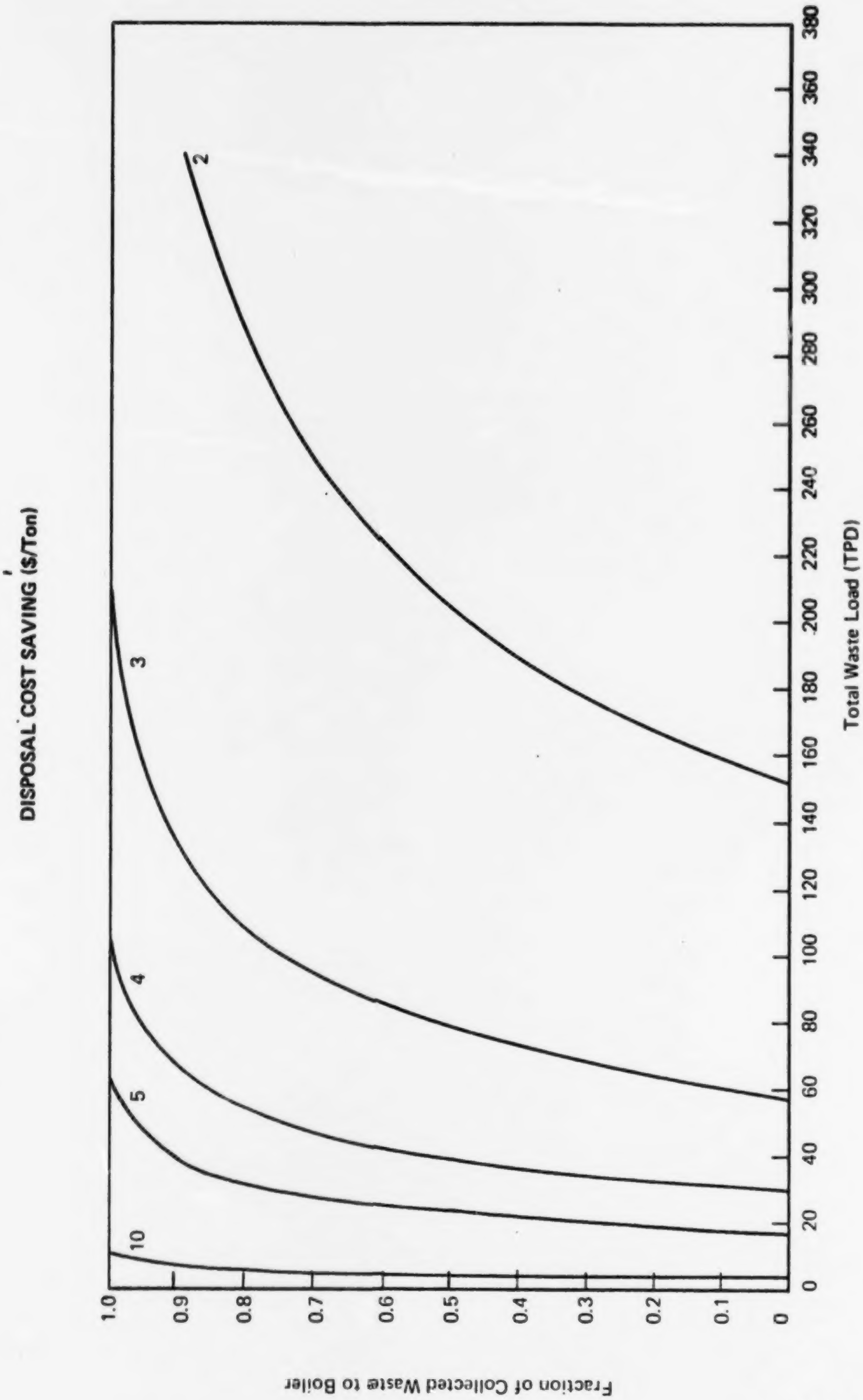

FIGURE 3.1.1.5.5-1

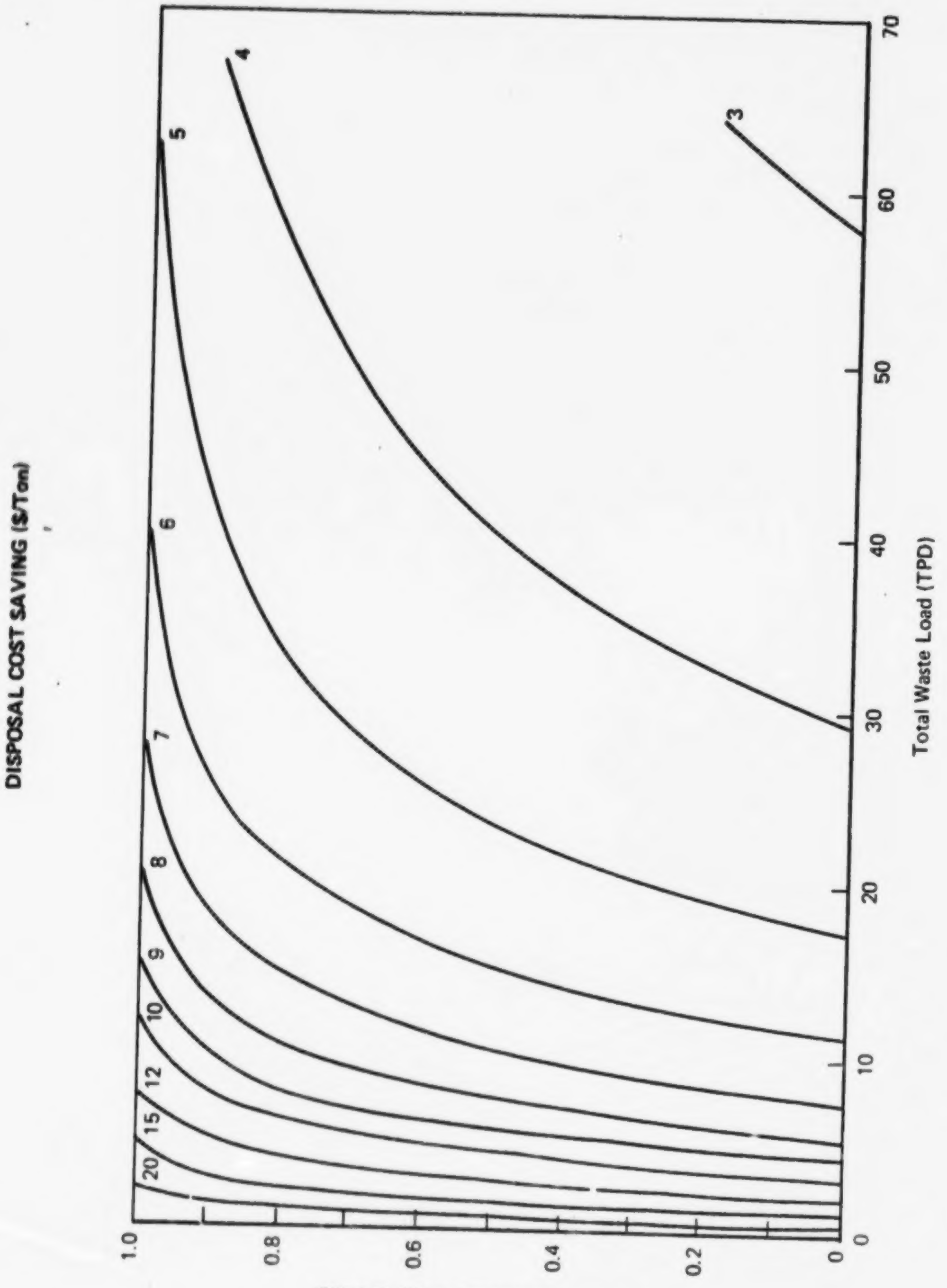

FIGURE 3.1.1.5.5-2

3.1.1.6 Results - Stoker Fired Boilers

For each stoker fired, coal burning Federal facility identified, a table of estimated capital and operating costs of conversion and a graph of net benefits of conversion are given in Appendix 3.1 The first entry in each table (Maximum refuse rate at 50% firing) gives the number of tons/day of Type I, II, and III wastes required to satisfy 50% of the facilities minimum load. Where minimum load data were supplied by the facilities, they were used directly. When data were not available, minimum load was assumed to be 25% of installed boiler capacity. This estimate was based on the general observation that most Federal facilities seem to use about 50% of installed capacity to supply maximum winter load and that steam utilization drops by about a factor of two in the summer. Calculations were based on minimum load to permit steady-state operation year round. While it was assumed for purposes of illustration that 50% of minimum load would be supplied from solid waste, the equations presented above enable calculations to be made for any percentage firing. From a practical point of view, the 50% range is reasonable for the relatively small boilers found in Federal installations, since much less tends to be uneconomic, and much more can create load matching problems. The calculations are based on minimum load requirements and no attempt has been made to pinpoint the specific boiler or boilers that might logically be converted within each facility. For several facilities where the load calculations indicate potentially large economic benefits of conversion, some of the boiler -specific considerations that would enter into an engineering design feasibility calculation are discussed in Section 3.3.

Data on available refuse from each facility was either obtained directly or estimated from employment and residential population, using multiplier factors of 2 lb/person/day and 3.2 lb/person/day respectively. Available refuse from other Federal facilities within a 50 mile radius was calculated from the Annual Report of Federal Civilian Employment by Geographical Area( ), using a multiplier factor of 2 lb/person/day. Wastes available from the city and county within a 25 mile radius were calculated from population figures, using a multiplier factor of 3.2 lb/person/day.

To illustrate the use of the Tables and graphs in Appendix 3.1, let us consider the data for Eilson AFB in Alaska. The installed capacity at Eilson is 600,000 lb/hr; 50% of minimum load is then estimated as 75,000 lb/hr or 1800×10^6 BTU/day. Since the fuel value of Type II waste is 9×10^6 BTU/ton, the waste load requirement would be 267 TPD, assuming a burning efficiency of 75% (i.e.,(1800/9) 0.75 = 267). Only 31.2 TPD are available from the facility itself. If this is all assumed to be paper waste, it could be used to supply 5.8% of minimum load in a Type II system. From the equations given in Section 3.1.1.4.5 on-site operating costs for preparation, storage, and firing are calculated to amount to \$25.01/ton and transportation and haulage costs are assumed equal to zero. Other entries are calculated similarly. The cost of coal at Eilson was given to us as $\$0.86/10^6$ BTU, allowing a credit of $7.75/ton of solid waste burned. There is in addition a disposal cost credit of $8.80/ton. The bar chart for Eilson shows the various costs, credits, and net benefits for a Type II system utilizing wastes from the facility alone, and from the facility plus other Federal installations, the city and the county. In this example, there would be a net cost for any Type II system. The county is not sufficiently large to justify a Type III system. For a Type I system, which is really only practical for the wastes generated on the base, the dollar benefits would also not offset the costs.

Table 3.1.1.6-1 summarizes these cases identified where net economic benefits could result from the use of solid waste as a supplementary fuel in Federally owned stoker-fired coal-burning boilers. There are of course important benefits, other than dollar savings, that could be derived from the use of solid waste as a supplementary fuel. The potential benefits of fossil fuel saving (even coal is a finite resource), and reduction in the land area required for ultimate waste disposal,for example, are difficult to quantify but could be of over-riding significance. For Chanute AFB in Rantoul, Illinois, for example, we have calculated small net costs of Type II energy recovery systems involving wastes from either the base alone or from the base and city combined. However, there is no longer landfill space on the base, and Champaign County itself is looking for new landfill sites. There are few areas available that would not involve taking valuable agricultural land out of production.

3.1.1.7 Results - TVA Boilers

The only large Federally owned pulverized coal utility-type boilers are under the jurisdiction of TVA. Table 3.1.1.7-1 summarizes the data that were made available to us on TVA installations. On the basis of this information, we have made a preliminary assessment of the technical feasibility of adapting the individual boilers to burn Type III waste. For pulverized coal boilers, only a prepared refuse derived Type III waste can be considered.

With reference to Table 3.1.1.7-1, the first two boilers listed are nuclear units and obviously unsuitable. Thirteen additional units are listed as unsuitable because they are of one of the following boiler types.

A -- Supercritical, once through, forced circulation type boilers.

B -- High pressure, controlled circulation type boilers with twin furnaces.

It is unlikely that the owners and operators of such units would be willing to burn solid waste until a great deal more is known about the fuel burning characteristics of refuse derived fuel in less sophisticated utility boilers.

Two units are questionable - one because there are no data on the present firing equipment and the other because of an abnormally high volumetric heat release which could cause problems.

Plant	Boiler Capacity M lbs/ST/HR	Boiler Pressure	Boiler Circ	Furnace Type	# of Burners	Burn Type	# of Pulverisers	Mfg.	Feasible Burn Waste
Browns Ferry	13380	950	Nuclear --						no
Sequoyah	14900	765	Nuclear --						no
Allen	2000	2400	Nat	Press	0		0	BW	?
Bull Run	6400	3500	1	Press	80	Tilt	10	CE	no
Colbert	1280	1800	Nat	Suct	18	Horiz	6	BW	yes
	3900	2400	1	Press	30	Horiz	10	BW	no
Cumberland	9300	3500	1	Press	48	Horiz	11	BW	no
Gallatin	1650	2000	C	Twin Suct	32	Tilt	8	CE	no
	1900	2000	C	"	32	Tilt	8	CE	no
Sevier	1280	1800	C	Twin Suct	24	Tilt	6	CE	no
Johnsonville	1000	1450	Nat	Suct	16	Tilt	4	CE	yes
	1100	2000	Nat	Suct	16	Horiz	2	FW	yes
Kingston	1000	1800	Nat	Suct	16	Tilt	4	CE	yes
	1280	1800	C	Twin Suct	24	Tilt	6	CE	no
Paradise	4900	2400	1	Press	14	Cyclone	4	BW	no
	8000	3500	1	Press	23	"	10	BW?	no
Shawnee	1000	1800	Nat	Suct	16	Horiz	4	BW	yes
Watts Bar	600	850	Nat	Suct	8	?	4	BW	H. Vol At RE
Widows Creek	1000	1450	Nat	Suct	16	Horiz	4	BW	yes
	850	1800	Nat	Suct	16	Horiz	4	BW	yes
	3850	2400	C	Twin Press	40	Tilt	10	CE	no
	3850	2400	C	"	40	Tilt	10	CE	no

TABLE 3.1.1.7-1

Seven units, averaging 1,300,000 pounds of steam per hour boiler generating capacity, appear to be adaptable. Firing 20% waste would require approximately 50,000 pounds of prepared Type III waste per hour--25 tons per hour, 600 tons per day.

Capital costs may be estimated roughly from the equations given in Table 3.1.1.3.6-1, modifying the refuse firing system costs as follows for tangentially fired boilers:

Receiving and Preparation		133,000
Storage (536,000 + 1337(TPD))		1,338,200
Refuse Firing		
Pneumatic conveyors (4)	111,200	
Installation	36,800	
Boiler firing system	22,500	
Total Direct Cost(DC)	170,500	
Engineering @ 10% DC	17,000	
Contractor Fee @ 8%DC	13,640	
Contingency @ 15%DC	25,575	
		226,715
		$1,697,915

Operating costs may be estimated from the relations given in Table 3.1.1.4.5-1 for a 600 TPD facility. They come to approximately $1.83/ton. To this must be added $14.00/ton for the fuel purchased, giving a total operating cost in the neighborhood of $15.83/ton. This is easily offset by the fuel savings credit, f Hw, of about $21.56/ton, where Hw = 14 x 10^6 BTU/ton for Type III waste, and the average value of coal, f, is presently about $1.54/$10^6$ BTU. We understand that an engineering design report on the potential for solid waste utilization in TVA boilers is expected to be issued by TVA in September. This will obviously cover the TVA installations in far greater depth than is possible here.

CONVERSION OPPORTUNITIES WITH POTENTIALLY FAVORABLE ECONOMICS

Federal Facility	System Type	Waste Source	$/ton Operating Costs	$/ton Fuel Value	$/ton Disposal Credit	$/ton Net Economic Benefit
928th Tactical Airlift at O'Hare	II	Facil. & other Fed. Instal.	28.14	21.78	5.10	(-1.26)
Chanute AFB	I	Facil.	15.00	12.30	11.73	9.03
	II	Facil.	19.49	7.38	11.73	(-.43)
Ft. Benj. Harrison	I	Facil	24.17	20.55	4.80	1.18
Iowa Army Ammun. Plant	II	Facil. & city	12.91	6.12	4.30	(-2.49)
Loring AFB	II	Facil.	19.27	23.04	8.27	12.04
	II	Facil. & other Fed. Instal.	26.21	23.04	8.11	4.94
	II	Facil. & city	22.22	23.04	7.74	8.56
	II	Facil. & county	14.31	23.04	2.90	11.63
Otis AFB	I	Facil.	17.59	34.50	1.96	18.87
	II	Facil.	23.94	20.70	1.96	(-1.28)
	II	Facil. & county	23.50	20.70	3.70	.90
Detroit Tank Plant	II	Facil. & city	15.92	17.37	3.47	4.92
Kincheloe AFB	II	Facil. & county	17.24	12.96	5.09	.81
K.I. Sawyer AFB	I	Facil.	18.38	21.60	8.40	11.62
	II	Facil.	27.56	24.93	8.40	5.77

TABLE 3.1.1.6-1 pg. 1 of 3

CONVERSION OPPORTUNITIES WITH POTENTIALLY FAVORABLE ECONOMICS

			$/ton			
Federal Facility	System Type	Waste Source	Operating Costs	Fuel Value	Disposal Credit	Net Economic Benefit
Camp Lejeune	I	Facil.	8.90	17.55	.72	9.37
	II	Facil.	7.02	10.53	.72	4.23
Rickenbacker AFB	I	Facil.	12.69	9.15	3.26	(-.28)
Defense Elec. Supply Center	II	Facil. & city	21.20	15.48	5.20	(-.52)
Wright-Patterson AFB	I	Facil.	11.32	27.75	3.53	19.96
	II	Facil	9.74	16.65	3.53	10.44
Tobyhanna Army Depot	I	Facil	18.44	14.55	5.84	1.95
ERDA-Savannah River	II	Facil & county	8.27	16.02	3.00	10.75
Holston Army Ammun.Plant	II	Facil. & city	14.33	14.31	3.60	3.58
Radford Army Ammun.Plant	II	Facil. & city	20.49	21.24	3.60	4.35
Marine Corp. Dev. & Education Command	I	Facil.	13.95	29.40	4.30	19.75
	II	Facil	16.12	17.64	4.30	5.82

TABLE 3.1.1.6-1 pg.2 of 3

CONVERSION OPPORTUNITIES WITH POTENTIALLY FAVORABLE ECONOMICS

Federal Facility	System Type	Water Source	$/ton Operating Costs	Fuel Value	Disposal Credit	Net Economic Benefit
Central Heating & Refrigeration Plant	I	Fed. Instal	9.69	28.35	2.90	21.56
	I	Fed. Instal.& city	9.16	28.35	2.70	21.89
	II	Fed. Instal.	8.45	17.01	2.90	11.46
	II	Fed. Instal. & city	6.56	17.01	1.95	12.40
Capital Hill Steam Plant	I	Facil.	17.83	28.80	4.25	15.22
	I	Facil. & other Fed. Instal.	11.40	28.80	2.90	20.30
	II	Facil. & other Fed. Instal.	10.42	17.28	2.70	9.56
West Heating Plant	I	Fed. Instal.	10.02	28.35	2.90	21.23
	II	Fed. instal.	8.62	17.01	2.50	10.89
	II	Fed. instal. & city	7.36	17.01	2.08	11.73
Washington Navy Yard	I	Facil. & other Fed. instal.	20.11	19.80	4.81	4.50
Virginia Heating & Refrigeration Plant	I	Fed. instal.	14.43	28.35	4.25	18.17
	II	Fed. instal.	9.70	17.01	3.50	10.81

TABLE 3.1.1.6-1 pg. 3 of 3

3.2 SENSITIVITY ANALYSIS

3.2.1 COMPARISON WITH OTHER FEASIBILITY ANALYSIS

There are very few published data on the burning of municipal type solid wastes in small steam-generating boilers, with which our feasibility estimates can be compared directly. The St. Louis experience relates to the use of prepared solid waste in a utility boiler, of a type found only in TVA installations among Federally-owned facilities. A number of industries routinely recover steam by burning processing wastes in their boilers. While the size of a typical industrial boiler is comparable to that in the majority of Federal facilities, the wastes that are handled are different (bagasse in sugar manufacturing plants; coffee grounds in instant coffee manufacturing; Kraft liquor in paper mills). Furthermore, in both industry and the Federal government, steam recovery incineration has often been adopted in preference to the burning of wastes in existing boilers. Part of the reason is the massive shift away from coal to oil and natural gas in steam boilers in response to recent air pollution control requirements. Modification of boilers designed for liquid or gaseous fuels, or reconversion of boilers that originally burned coal, to enable the burning of solid waste as a supplementary fuel, is in many cases either technically infeasible or prohibitively expensive. A number of Federal facilities are considering the use of solid waste as a supplementary fuel, but the results of economic analysis have not been released for publication.

H. G. Rigo(2) in a technical evaluation study of solid waste heat reclamation at the Philadelphis Naval Shipyard, provides a capital cost estimate for a system very similar to our Type II to be used in conjunction with an agitated bed incinerator complex. Although the systems are not identical, some comparison of cost estimates can be made as shown in Table 3.2.1-1. While our estimates for equipment costs are somewhat higher, the major discrepancy is seen to result from the estimated installation costs.

For the burning of Type III wastes within an existing boiler, operating costs (exclusive of capital amortization) estimated in Reference 2 and by ADL are compared in Table 3.2.1-2 for a 57.1 TPD installation. Agreement is seen to be reasonably good. The major discrepancies are in labor costs, (where we have added a 20% labor overhead and a 50% administrative overhead onto a slightly higher base salary) and in the credits taken for fuel savings (where Reference 3.2-1 bases their calculations on the value of the steam generated, and we base our calculations on the value of the fuel displaced).

COMPARISON OF COST ESTIMATES FOR AN UNREFINED COARSE PRODUCE WITH STORAGE (REFERENCE 3.2-1 AND ADL)

	Costs ($)	
Equipment	**Reference 3.2-1**	**ADL**
Conveyers (2)	10,000	53,800
25 TPH Shredders (2)	72,000	90,000
Bucket Elevators (2)	8,000	-
Storage	150,000	210,000
Feeders	25,000	37,100
Receiving Hopper	-	8.000
Total Equipment Costs (EC)	265,000	398,900
Installation	18,250 (6.9% EC)	190,100 (47.7%EC)
Total Direct Cost	283,250	589,000
Engineering Profit, O.H., Contingency	99,150 (35%)	194,370 (33%)
Total Fixed Capital Investment	382,400	783,370

Table 3.2.1-1

COMPARISON OF OPERATING COST ESTIMATES FOR FIRING TYPE III WASTES IN EXISTING BOILERS (Reference 3.2-1 and ADL)

Operating Cost Elements	Reference 3.2-1	ADL
Electricity (920 MW/yr)	20,200(10.022/kwh)	23,000(10.025/kwh)
Labor (3 people, 8 hrs/day)	36,000	68,000($5.00/hr+70%O.H.)
Maintenance	8% od Capital Inv.	21% of Capital Inv.
Capital Amortization	0.119 x Capital Inv.	0.149 x Capital Inv.
Fuel savings on 137,500 klb/yr of steam generated	-433,000(steam @ $2.35/klb)	-215,875(oil @ $1574/$10^6$ BTU)
Disposal Savings on 20,800 TPY @ $11.89/ton	-245,200	-245,200

TABLE 3.2.1-2

3.2.2 EFFECT OF ESTIMATED PARAMETERS ON CALCULATED ECONOMIC BENEFITS

In Section 2.0, we estimated the net economic benefits of burning solid waste as a supplementary fuel as the difference between savings (of fuel and disposal costs) and costs (capital amoritization, labor, electric power, maintenance, transfer and haulage). The basic equation may be written in the form:

$$\text{Net Benefits} = \text{Savings} - \text{Costs}$$

$$NB = (fHw + C_d) - [(C_I+C_o) + (C_t + C_h M)] \quad (2\ )$$

where the symbols are defined in the Glossary.and $C_s = C_I + C_o$

For Type I Systems operated on segregated paper and plastic wastes supplied from the facility itself, the transfer and haulage costs $(C_t+C_h M)$ may be set equal to zero.

Equation (3) for this case reduce to:

$$(N.B.)_I = (fHw + C_d) - (C_I + C_o) \quad (3)$$

For Type I wastes, Hw = 15 MM BTU/ton. The average and range of values of f and C_d for the cases examined in this work are:

$$f_{av} = \$1.54/\text{MMBTU } (\$0.50\text{-}3.00)$$

$$(C_d)av = \$4.90/\text{ton } (\$1\text{-}12)$$

Using these average values, and the value of $(C_I + C_o)$ given in Table 3.1.1.5.1-1 for a facility handling less than 100 TPD (boiler load requirements less than about 60,000 lb/hr), the net benefits become:

$$(N.B.)_I = (28) - (6.25 + \frac{176}{(TPD)})$$

The refuse available from Federal facilities is found to range from 1.3 to 175 TPD, with an average of 30 TPD. Within this range, the net benefits are a strong function of the wastes available, assuming that the boiler capacity is sufficient to accept the total quantity. Values of C_s for the range of available facility wastes are shown in Table 3.2.2-1. In the vicinity of 2 TPD, costs would exceed savings, even if the constants in the equation for C_s were a factor of two too high. Above about 50 TPD, net savings could be realized, even if the constants were a factor of two too low. If the fuel and disposal cost savings were in the upper part of their range $(15\ f_{max}+C_{d,max})$ = \$57/ton, it would still be uneconomic to handle as little as 2 TPD). In the lower limit of savings, $(15\ f_{min} + C_{d,min})$ = \$8.50/ton, benefits, or small costs would be expected above about 70 TPD. Since the estimated value of C_s is not expected to be in error by more than a factor of two, it is probably safe to conclude that any facility able to collect over 50 TPD of source segregated waste, and having a solids burning boiler with a capacity of more than 30,000 lb/hr, might find it worthwhile to investigate the possibility of implementing a Type I system.

We have assumed that source segregation is only practical within a given Federal facility. If community wastes must be included to make the system economic, it would probably be necessary to go to a Type II system.

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COST PARAMETER ESTIMATES FOR TYPE I SYSTEMS

TPD	$C_I + C_o = 6.25 + 176/TPD$ (\$/ton)
2	94.25
10	23.85
20	15.05
30	12.12
40	10.65
50	9.77
60	9.18
70	8.76
80	8.45
90	8.20
100	8.01

TABLE 3.2.2-1

COST PARAMETER ESTIMATES FOR TYPE II SYSTEMS

TPD	$C_s = 3.50 + 577/TPD$ (TPD 100) $C_s = 2.68 + 754/TPD$ (TPD 100) $/ton
2	292
20	32.35
50	15.04
100	9.27
150	7.70
200	6.45
250	5.70
300	5.19

TABLE 3.2.2-2

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For a given quantity of waste, a Type II system is always more costly than a Type I system, and the savings are somewhat less due to the lower heat content of the refuse (9MMBTU/ton for municipal waste compared to 15 MMBTU/ton for segregated wastes). For the Type II system, using average values of f and C_d, the net benefits are given approximately by:

$$(N.B.)_{II} \approx (18.76) - [C_s + (C_t + M)]\, C_h \qquad (4)$$

The transfer and haulage costs, as discussed in Section 3.1.1.2, lie in the range of $5-10/ton for haul distances of 25-50 miles. Thus if net economic benefits are to be achieved C_s should be in the vicinity of $8-$14/ton. A listing of estimated C_s values as a function of quantity of waste handled is given in Table 3.2.2-2. Allowing for possible errors in C_s, we would suggest that Type II systems set up in cooperation with the surrounding community are most likely to show favorable economics in a size range over about 100 TPD, supplying a boiler load greater than about 60,000 lb/hr. If a facility generates in the order of 100 TPD itself, and has sufficient load requirements, it might find it worthwhile to set up a Type II system, and to accept community wastes at a later date, with a view towards reducing $/ton costs.

3.2.3 BOILER SPECIFIC CONSIDERATIONS

Most of the foregoing analysis has been based on load requirements. The choice of the specific boiler or boilers within a given facility that could most effectively be converted is beyond the scope of the present program. This choice depends not only on load, but on detailed boiler design, age of the boiler, space available in the vicinity of the boiler, and other engineering factors. A number of boiler-specific considerations that might enter into a design feasibility analysis are discussed in a general way in this section.

Boiler types which should be relatively easy to convert to handle properly prepared solid waste as a supplementary fuel are listed in Table 3.2.3-1, and sketched in Figure 3.2.3-1. They are for the most part stoker or hopper fed coal burning boilers, which should be able to handle Type I, II or III wastes. The pulverized coal (PC) boilers would generally require Type III wastes. The three and four drum configurations might be fitted with ash handling and solids delivery equipment, even if presently burning oil or natural gas.

Coal fired boilers that might be more difficult and expensive to convert are listed in Table 3.2.3-2 and sketched in Figure 3.2.3-2.

Sketch E shows a two drum boiler with side and front water walls, water-cooled bridge walls and a two or three pass baffling. This type of unit is normally fired by a spreader, under feed or traveling grate stoker. To convert for solid waste firing, the front wall would have to be altered either by bending tubes to provide an opening for the introduction of waste or by raising the lower header and shortening the tubes. If the wall construction were of either the tangent tube or welded wall type, the header would have to be raised. Water cooled bridge walls would have to be penetrated for over fire tube-nozzles. If these walls were of a tangent tube or welded wall construction, all of the over fire air would have to be introduced through the front wall. This is a compromise arrangement which is not always effective. All of these modifications are time consuming and expensive. Furthermore, any time that modifications are made to tubes in a boiler there is a possibility of upsetting the water and steam circulation. In some cases, boilers represented schematically by Sketch E are made without baffles. In such a design, in addition to the above modifications, there may be more particulate emission from the boiler and the possibility of plugging the gas passages and erosion of the tubes.

Sketch K shows a two drum boiler, with the top drum located ahead of the lower drum, having side water walls, a long mud wall, and baffles for two or three passes. To convert this type of boiler for solid waste firing, the front wall would have to be altered either by bending tubes, or by raising the header and shortening the tubes to provide openings for the introduction of waste into the burners. The header would have to be raised only if this front wall were of the tangent tube or welded wall construction, which is not typical for this type of design. If a type K boiler has been installed with the lower drum set on saddles resting on the floor, it may not be possible to install over-fire air in the rear. It is also possible that the furnace volume may not be sufficient for burning waste material. In such a case, it might be necessary to raise the boiler or to excavate the pit to increase the furnace volume.

Sketch L shows a longitudinal drum type boiler with front water walls. To convert for solid waste firing, the front wall would have to be altered either by bending tubes or by raising the header and shortening the tubes in order to introduce waste into the furnace. Provided that this type of boiler is presently stoker fired, no further changes should be required. However, this is the basic design of most "package" boilers which are oil or gas fired and in these cases conversion would be technically infeasible. On the other hand, lower capacity, field erected, oil or gas fired boilers of type K are usually no different from the stoker fired units and should also only require front wall modifications, and the addition of ash and solids handling equipment.

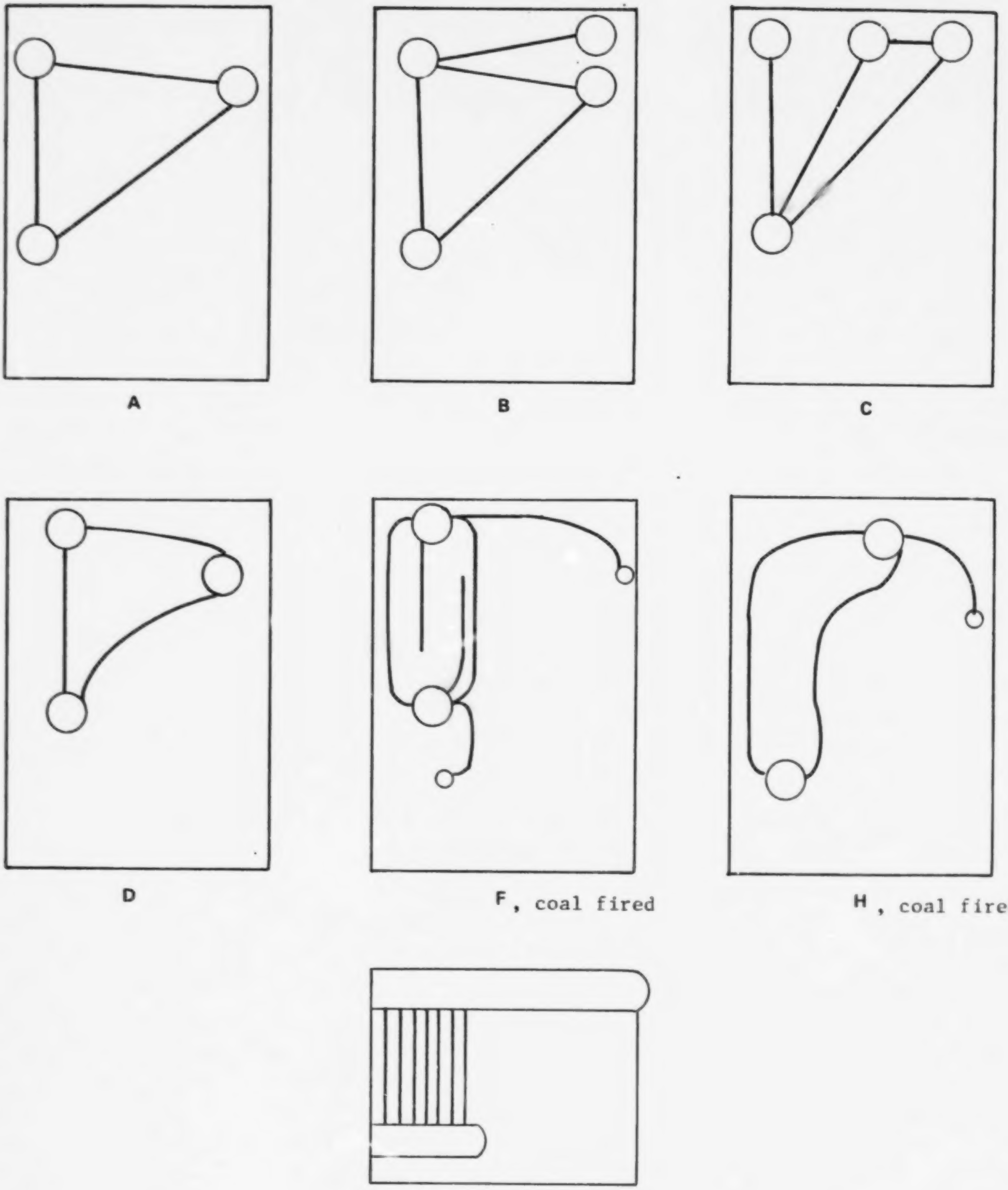
Table 3.2.3-3 lists types of boilers which are not convertible for technical reasons. These include controlled circulation, once through, super critical, and/or wet bottom types similar to sketches E, F, G, H, and K in Figure 3.2.3-1,2,3. Also included are boiler types designed for only oil and gas firing, for which the volumetric heat releases are extremely high. The gas passes are tight and particulate matter could bridge the spaces. Furthermore the high gas velocities in the passes could cause erosion when particulate matter is carried in the gas streams. Capacity would have to be down rated. Forced draft and induced draft fans would have to be replaced. Front and rear water wall modification would be required to gain access to the furnace required to burn waste. Furnace bottoms would require modifications to be able to remove ash.

66<

Some blowers would have to be added and modified. Air heaters and economizers would possibly require modification.

Sketch M Boilers, also known as A types, cannot be converted because they are generally designed for oil and gas firing and the gas passes are so designed that it is practically impossible to keep them free from fly ash or particulate accumulation.

87<



A

B

C

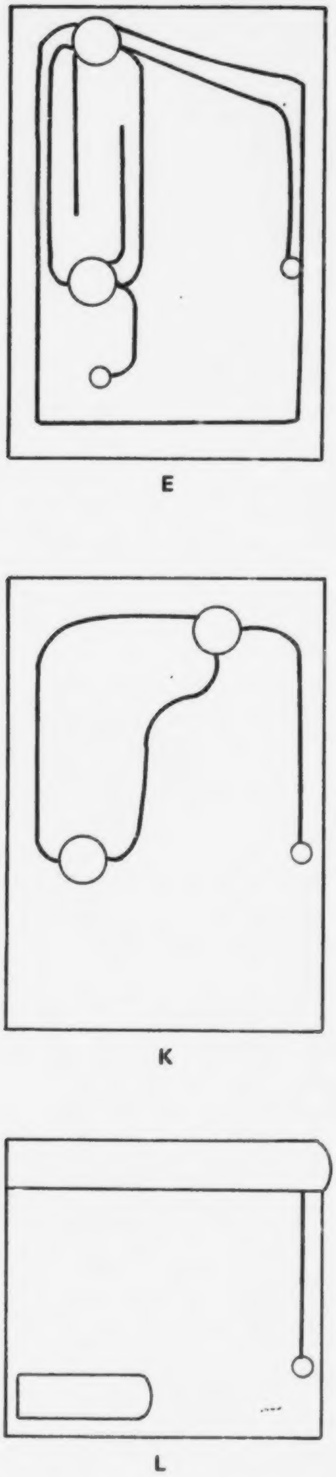
D

F, coal fired

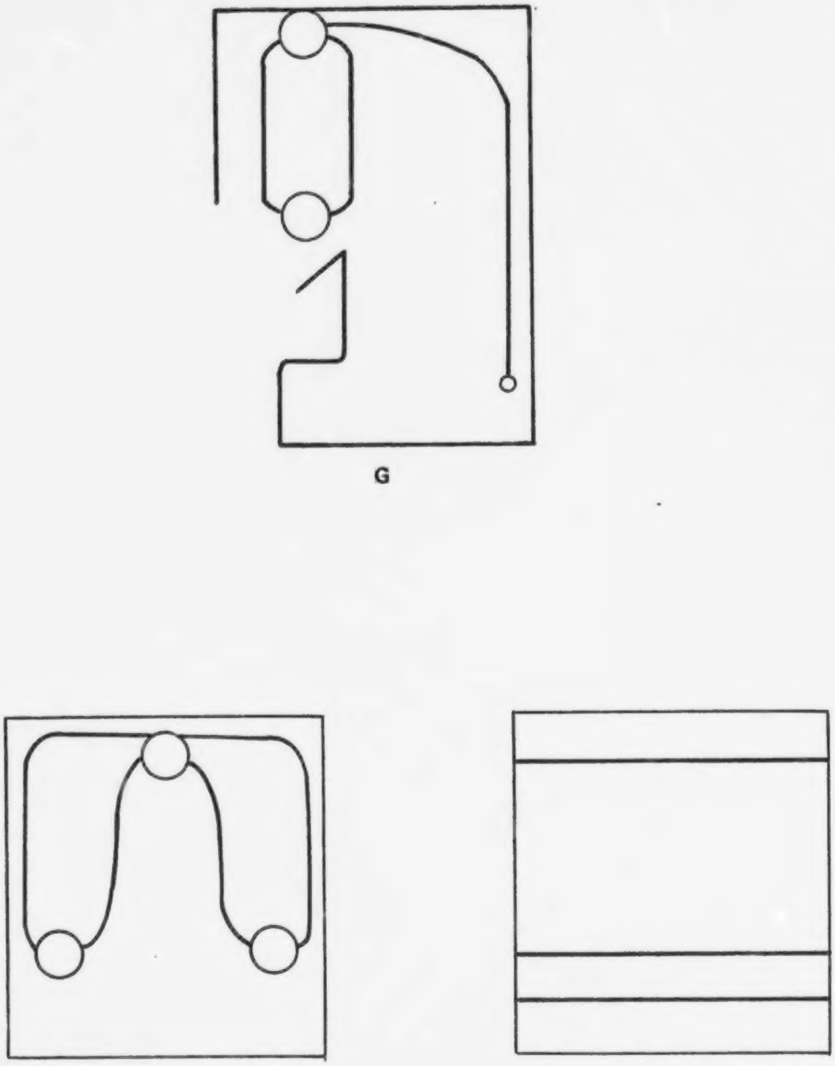
H, coal fired

J

Boiler Configurations Easy to Convert to Solid Waste Firing
FIGURE 3.2.3-1



Boiler Configurations Difficult to Convert to Solid Waste Firing
FIGURE 3.2.3-2



G

M Front

M Side

Boiler Configurations Not Convertible to Solid Waste Firing

FIGURE 3.2.3-3

EASY TO CONVERT TO FUEL FIRING

Boiler Type	Water Walls	Baffles	Firing Type	Sketch
4 Drum	with or w/out	3 or 4 pass	coal, oil, gas	B or C
3 "	with or w/out	3 or 4 pass	coal, oil, gas	A or D
2 " SGU	side, hi, or no front	2 or 3 pass	spreader	F
2 " "	"	2 or 3 pass	underfeed	F
2 " "	"	"	hopper feed	F
2 " "	with	"	PC	F
2 " "	side, hi, or no front	single	spreader	F
2 " "	with	single	PC	F
2 " Z	side, hi, or no front	2 or 3 pass	spreader	H
2 " Z	"	"	underfeed	H
2 " Z	"	"	hopper fed	H
2 " longitudinal	"	3 pass	spreader	J
2 " "	"	"	underfeed	J
2 " "	"	"	hopperfed	J
2 " "	with	"	PC	J

TABLE 3.2.3-1

DIFFICULT AND EXPENSIVE BUT CONVERTIBLE TO WASTE FUEL FIRING

Boiler Type	Water Walls	Baffles	Firing Type	Sketch
2 Drum SGU	side lo front	2 or 3 pass	spreader	E
"	"	"	underfeed	E
"	"	"	hopper fed	E
"	"	single	spreader	E
" Z	"	2 or 3 pass	spreader	K
" Z	"	"	underfeed	K
" Z	"	"	hopper fed	K
" longitudinal	"	"	spreader	L
" "	"	"	hopper fed	L
" "	"	"	underfeed	L

TABLE 3.2.3-2

NOT CONVERTIBLE TO WASTE FUEL FIRING

Boiler Type	Water Walls	Baffles	Firing Type	Sketch
2 Drum SGU	with	single	oil, gas	G
"	"	2 or 3	oil, gas	E or F
" Z	"	"	oil, gas	H or K
" Z	"	cross flow	coal, oil, gas	H or K
" A	"	2, 3, 4	coal, oil, gas	M

SGU having controlled circulation or once-through circulation

SGU supercritical pressures

SGU wet bottoms

Note: SGU -- steam generation unit
When only coal firing is mentioned, any
type of stoker or pulverized coal is included.

TABLE 3.2.3-3

4.0 DISCUSSION OF POTENTIAL CONVERSION OPPORTUNITIES

A number of Federal facilities were identified in Section 3.0, where it would appear that net economic benefits might result from the use of properly prepared solid waste as a supplementary fuel. While the potential for net economic benefit is one factor to be considered in implementation planning, it is by no means the only one. Some of the additional considerations are pointed out below.

A list of stoker-fired conversion opportunities with potentially favorable economics was presented in Table 3.1.1.6-1. In some cases, more than one option is presented for a given facility - a Type I or Type II system using facility wastes alone; or a Type II system using in addition wastes for other Federal facilities, the surrounding city or the sourrounding county. A system based on facility wastes alone can be much easier to implement than one which requires negotiation with outside groups. For the same amount of waste within a given facility, the economic benefits of a Type I system always exceed those of a Type II system. However, the voluntary source segregation necessary for successful implementation of a Type I system may or may not be easy to bring about, depending on many factors. Furthermore, if a facility could make use of an amount of solid waste fuel in excess of that generated on-site, a Type II system might be preferred, run initially with facility wastes and subsequently with additional wastes from outside. In general, the larger the amount of waste handled in a Type II system, provided the waste does not have to be transported too far, the lower the costs will be in $/ton, and the greater the economic benefits.

Type III systems for Federally-owned facilities were found to be potentially cost effective only for some of the TVA installations and for Wright-Patterson AFB. The fundamental reason is that there are two very important constraints placed on the size of a Type III firing unit:

1. A plant manufacturing Type III fuel has an economic minimum size of approximately 1,000 tons per day of refuse. Hence, such a plant would only be set up in an area where the population within a 25 mile radius is in excess of about 500,000. (The 25 mile limitation is not absolute, but was the area we were asked to consider under the program.)
2. Since the capital amortization and operating costs of a Type III firing system in $/ton decrease sharply with the amount of waste burned there is a minimum practical firing range of about 50 TPD below which the use of Type III fuel would be impractical.

The only convertible Federal facility identified within a community of 500,000 or more, with a sufficient load requirement to consider installation of a Type III firing system is Wright Patterson AFB. Type III firing systems are technically feasible for several TVA installations, which certainly have sufficient load requirements to accept a significant fraction of the output of a Type III plant. With the possible exception of Bull Run and Widows Creek, however, no TVA installations are located within 25 miles of a community of 500,000. Although the 25 mile limitation for community wastes was a specific restriction of our program, it is likely that cost effective Type III systems receiving wastes from a larger area could be implemented for several TVA facilities. TVA has already initiated a $400,000 program to investigate such possibilities, obviously in far greater depth than would be possible within the context of our study.

Wright-Patterson AFB has a minimum (summer) load requirement of 81,000 lb/hr. The quantity of Type III fuel needed to supply 100% of this load is of the order of 185 TPD (assuming a 75% burning efficiency). While we do not know definitively which of Wright-Patterson's boilers might be technically suitable for conversion, the base does have four traveling grate stoker fired boilers with a capacity of 100,000 lb/hr, and one with a capacity of 119,600 lb/hr. The capital investment for a 185 TPD Type III firing system is calculated from Table 3.1.1.5.3-1 as $929,049, exclusive of air pollution control equipment.

Operating costs, fuel savings credits and net economic benefits are summarized below:

On-site operating costs = 501/(TPD) + 0.83 = $3.59/ton

Type III fuel costs = $14.00/ton

Total costs $17.59/ton

$$\text{Fuel savings} = fHw = \frac{\$1.85}{\text{MMBTU}} \times \frac{14\text{MMBTU}}{\text{ton}} = \$25.90/\text{ton}$$

Net benefits $8.49/ton

We have previously indicated that Type I and Type II systems also appear to be economically feasible for Wright-Patterson.

The potential conversion opportunities identified as part of this report are based on current costs of alternative fuels and current costs of disposal. These costs are almost certain to increase with time, making the use of solid waste as a supplementary fuel more attractive for more installations. We have also based most of our analysis on the use of solid waste to supply 50% of minimum load. If a greater fraction of the load were met by the solid waste fuel, there would be economies of scale in the waste firing system, and correspondingly increased economic benefits. Our economic analysis has been largely confined to facilities currently burning coal. As indicated in Section 3.2.3, some types of oil fired units could also be modified with little difficulty and at modest cost to handle a solid waste fuel.

5.0 REFERENCES

STUDY OF THE FEASIBILITY OF FEDERAL PROCUREMENT OF FUELS PRODUCED FROM SOLID WASTE

1. Annual Report of Federal Civilian Employment by Geographic Area, December 31, 1972, Prepared by U.S. Civil Service Commission

2. H. G. Rigo, Technical Evaluation Study: Solid Waste Heat Reclamation at Philadelphia Naval Shipyard, Philadelphia, Pa., May 1974, Department of the Army, Construction Engineering Research Lab.

APPENDIX A

APPENDIX A

This appendix contains information on federally owned boilers. It was compiled from information supplied by various government agencies and through phone contacts primarily with operators of category A and B boilers. The installations are listed by state followed by a map indicating the locations of the boilers. This list is not a complete list of all federally owned boilers.

The chart for each state contains the following information:

- Boiler category - A, B or C - as explained in text;
- Name of facility and the Standard Metropolitan Statistical Area (SMSA) or county in which it is located;
- Agency ownership;
- Rated capacity in 1000 lb steam/hr;
- Load in 1000 lb steam/hr and an indication of whether the value is an average, peak, minimum, summer, winter, etc.
- Type of firing: pulverized coal (p.c.)
  stokers (travelling grate, spreader, etc.);
- Date of installation;
- Refuse capacity and combustion firing % - amount of solid waste facility can fire based on the given per cent firing;
- Refuse supply - facility: based on information supplied by facility or responsible federal agency.
  other federal facility: based on 2 lb/employee/day times the number of federal employees in the county or SMSA
  community: based on 3.2 lb/person/day times population

(In converting wastes from cubic yards to tons, a conversion of 8 cu.yd.= 1 ton was used.)

- Notes - includes any air pollution control (APC) equipment (MC-mechanical collector; ESP-electrostatic precipatator) and the efficiency; current firing if not coal; limitations that may prevent conversion, i.e., package boiler; source of community waste, i.e., city or county

The maps following each chart show locations of all boilers and 25 mile radius for category A and B boilers. The key is:

⊙ Category A; ◌ Category B; x Category C

'78<

UNITS

33,000 BTU/BHp

1000 BTU/hr - 1 lb steam/hr

1 MW - 10^6 watts

1 watt = 0.0569 BTU/min.

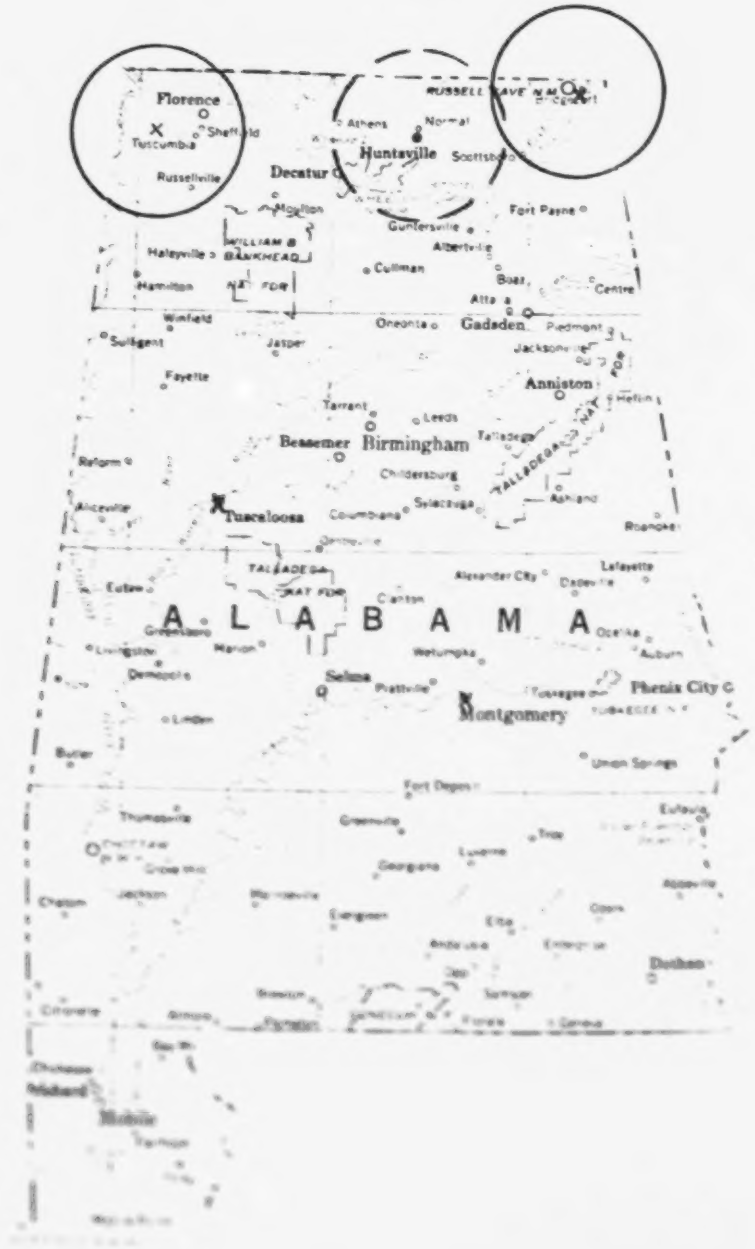
1 MW = 56,900 BTU/min. = 3,414,000 BTU/hr
= 3,414 lb steam/hr

Alabama

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
A	Colbert County/ Colbert	TVA	4@ 211.65 MW ea	avg. load is 55% of design	p.c.	1955		50	small		111	M.C. and ESP MC-50% ESP- 88 to 97%; waste from county
			550 MW	avg load is 51% of design	p.c.	1965		50				ESP-50%; not suitable for conv.
	Jackson County/ Widows Creek	TVA	6@ 140.6 MW ea	avg. load is 46% of design	p.c.	1952 to 1954		50	small		88	MC-60%, waste from county
			575 MW	avg. load is 57% of design	p.c.	1960		50				ESP-95%
			550 MW			1964						ESP-50%
B	Huntsville SMSA/ Redstone Arsenal	Army	4@ 40 ea	winter: 100 to 120 summer: 100	oil	1956 to 1959						firing #5 fuel oil;no APC
C	Montgomery SMSA/ Maxwell AFB	Air Force	5 boilers		gas							natural gas is primary and present fuel; oil is alternate
	Montgomery SMSA/VA Hospital	VA	27,650 Total		gas							gas with #2 fuel oil as alternate

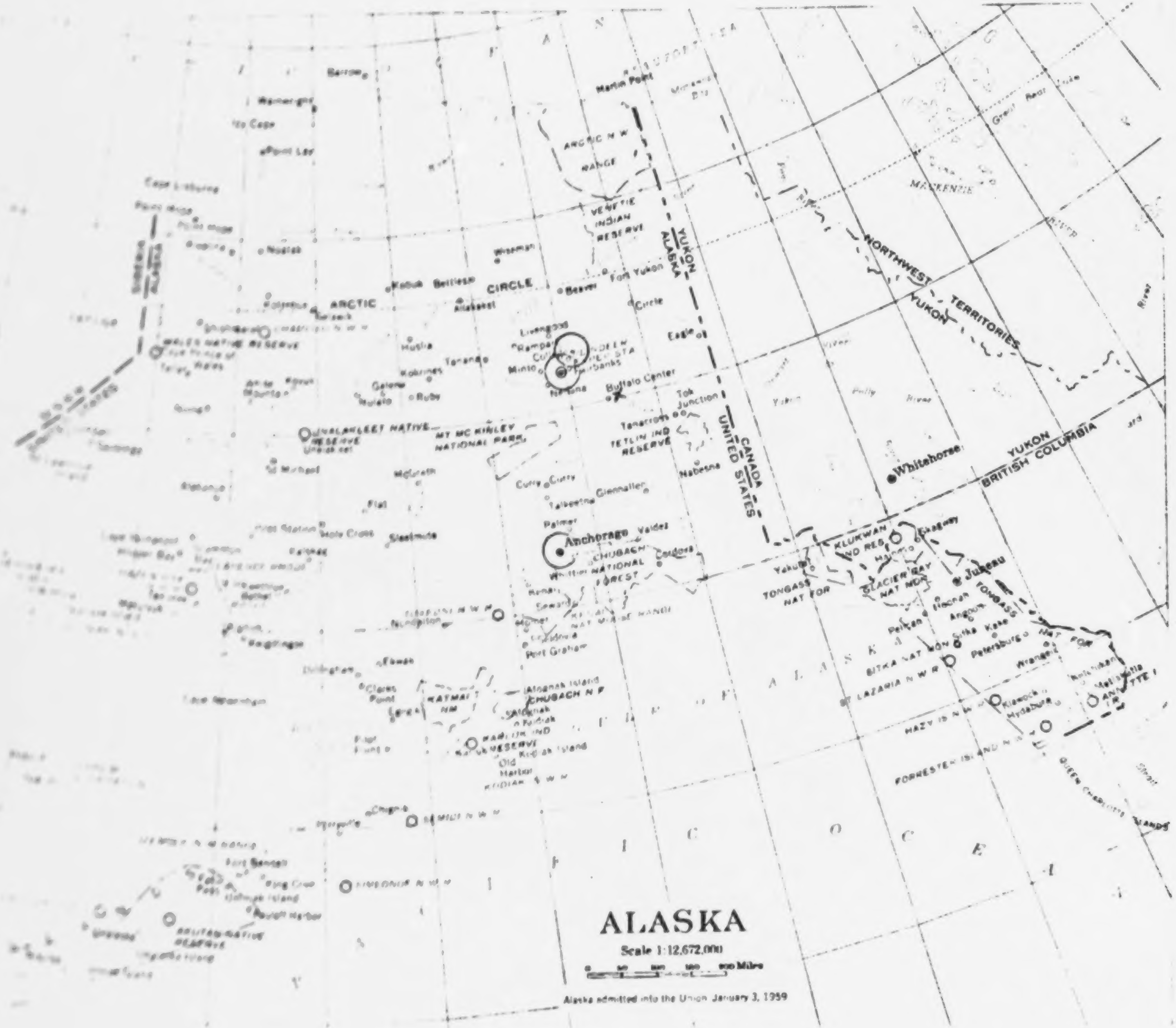
Alabama

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
Tuscaloosa SMSA/ VA Hospital	VA	37 (Total)		gas							gas and #2 fuel as alternate


Florence
Sheffield
Tuscumbia
Russellville
Decatur
Athens
Normal
Huntsville
Scottsboro
RUSSELL CAVE N.M.
Bridgeport
Fort Payne
Moulton
Guntersville
Albertville
WILLIAM B. BANKHEAD NAT. FOR.
Haleyville
Hamilton
Cullman
Boaz
Centre
Attalla
Gadsden
Oneonta
Piedmont
Winfield
Sulligent
Jasper
Jacksonville
Fayette
Anniston
Heflin
Tarrant
Leeds
Bessemer
Birmingham
Talladega
TALLADEGA NAT. FOR.
Reform
Childersburg
Sylacauga
Ashland
Aliceville
Tuscaloosa
Columbiana
Roanoke
Centreville
TALLADEGA NAT. FOR.
Lafayette
Alexander City
Dadeville
Eutaw
Clanton
A L A B A M A
Greensboro
Opelika
Livingston
Marion
Wetumpka
Auburn
Demopolis
Selma
Prattville
Tuskegee
Phenix City
Montgomery
TUSKEGEE N.F.
Linden
Butler
Union Springs
Fort Deposit
Thomasville
Greenville
Eufaula
Troy
Luverne
Grove Hill
Georgiana
Abbeville
Chatom
Jackson
Monroeville
Evergreen
Elba
Ozark
Andalusia
Enterprise
Dothan
Opp
Samson
Brewton
Citronelle
Atmore
Flomaton
Florala
Geneva
Chickasaw
Prichard
Mobile
Fairhope

Alaska

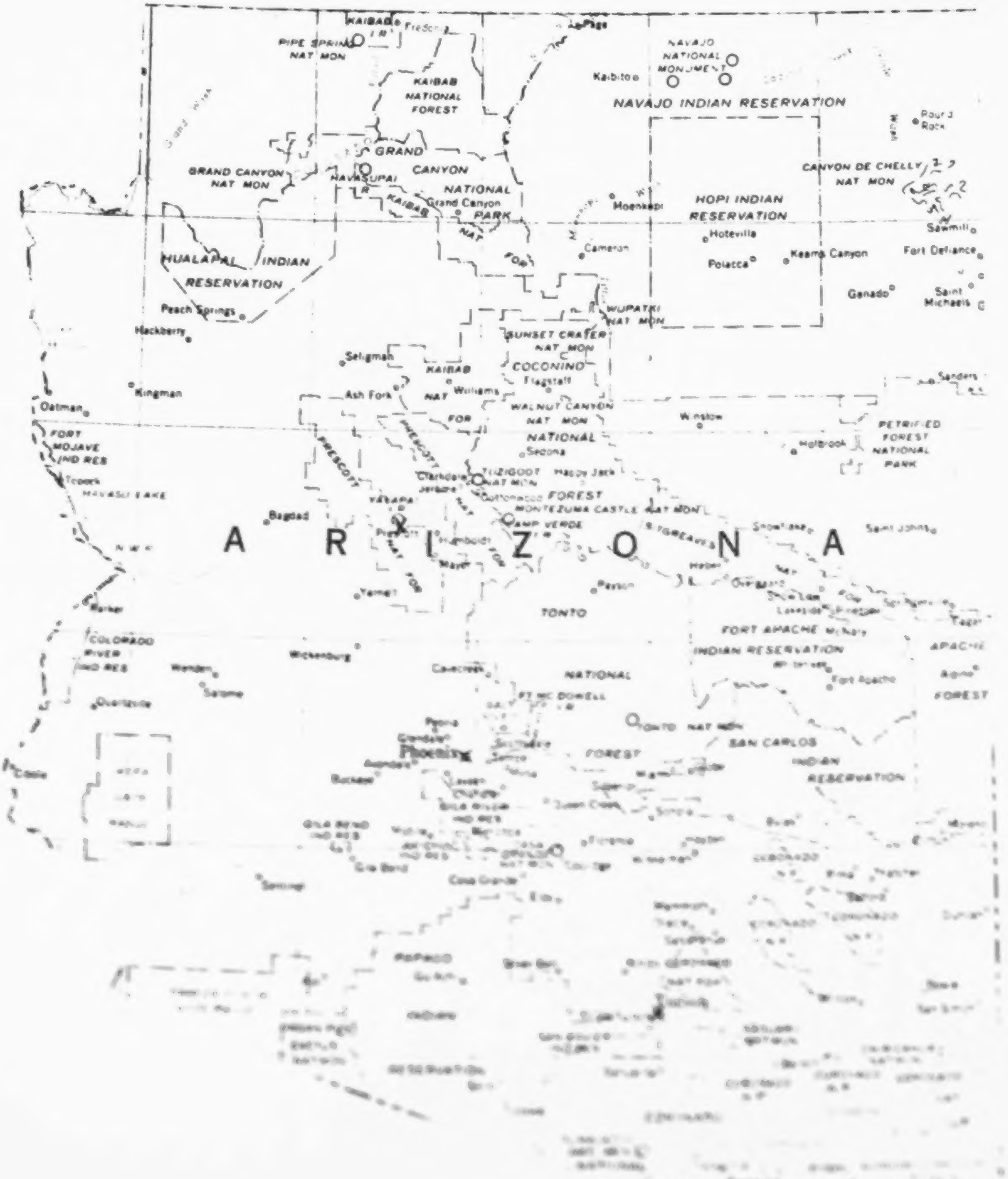
SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
/Ft. Richardson	Army	8@ 135 ea								279	4 boilers have been converted to gas while 4 still burn coal; waste from city of Anchorage
/Eielson AFB	Air Force	6@ 120 ea	avg. 350 (only 5 boilers in oper.)	travelling grate stokes	1950-1951	267	50	31.2	2.0	103	M.C.;have abundant supply of coal; waste from City of Fairbanks
/[illegible] AFB	Air Force	3@ 110 ea								103	11 other boilers fire oil-24,880,000 #/hr total; waste from City of Anchorage
/Ft. Greely	Army	3@ 50 ea		oil							packaged boilers, burn oil



ALASKA
Scale 1:12,672,000
Alaska admitted into the Union January 3, 1959
Barrow
Wainwright
Point Lay
Cape Lisburne
Point Hope
Noatak
Kobuk
Bettles
Wiseman
ARCTIC CIRCLE
ARCTIC N W RANGE
Martin Point
VENETIE INDIAN RESERVE
YUKON
ALASKA
Beaver
Fort Yukon
Circle
Eagle
Livengood
Rampart
Minto
Fairbanks
Nenana
Buffalo Center
Tok Junction
Tanacross
TETLIN IND RESERVE
Nabesna
CANADA
UNITED STATES
Hughes
Huslia
Tanana
Kokrines
Galena
Ruby
Nulato
UNALAKLEET NATIVE RESERVE
Unalakleet
St Michael
MT MC KINLEY NATIONAL PARK
McGrath
Flat
Curry
Talkeetna
Glennallen
Palmer
Anchorage
Valdez
Cordova
Whittier
CHUGACH NATIONAL FOREST
Kenai
Seward
Homer
Port Graham
Afognak Island
CHUGACH N F
Kodiak
Kodiak Island
Old Harbor
KATMAI NM
Dillingham
Bethel
Holy Cross
Sleetmute
Chignik
Cold Bay
Unimak Island
Unalaska
Yakutat
TONGASS NAT FOR
KLUKWAN IND RES
Haines
Skagway
Juneau
GLACIER BAY NAT MON
Pelican
Angoon
Sitka
Petersburg
Wrangell
Ketchikan
Klawock
Hydaburg
SITKA NAT MON
ST LAZARIA N W R
HAZY IS N W R
FORRESTER ISLAND N W R
ANNETTE IS
QUEEN CHARLOTTE ISLANDS
Whitehorse
YUKON
BRITISH COLUMBIA
NORTHWEST TERRITORIES
MACKENZIE
Great Bear Lake
Yukon River
Pelly River
P A C I F I C   O C E A N
G U L F   O F   A L A S K A
WALES NATIVE RESERVE
Teller
Nome
ALEUTIAN NATIVE RESERVE
Fort Randall

Arizona

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
Phoenix SMSA/ VA Hospital	VA	30 9 ea									gas and #2 oil
Yavapai County /VA Hospital	VA	3-61 total									gas and #2 oil
Tucson SMSA/ VA Hospital	VA	3-45 total									gas and #2 oil


ARIZONA
KAIBAB I R
Fredonia
PIPE SPRING NAT MON
KAIBAB NATIONAL FOREST
GRAND CANYON NATIONAL PARK
GRAND CANYON NAT MON
HAVASUPAI I R
KAIBAB NAT FOR
Grand Canyon
Page
NAVAJO NATIONAL MONUMENT
Kaibito
NAVAJO INDIAN RESERVATION
Round Rock
CANYON DE CHELLY NAT MON
HOPI INDIAN RESERVATION
Moenkopi
Hotevilla
Polacca
Keams Canyon
Fort Defiance
Sawmill
Ganado
Saint Michaels
Cameron
WUPATKI NAT MON
HUALAPAI INDIAN RESERVATION
Peach Springs
Hackberry
Seligman
SUNSET CRATER NAT MON
COCONINO
Flagstaff
KAIBAB NAT FOR
Williams
Ash Fork
Kingman
Oatman
WALNUT CANYON NAT MON
NATIONAL
Sedona
Winslow
Sanders
PETRIFIED FOREST NATIONAL PARK
Holbrook
FORT MOJAVE IND RES
Topock
HAVASU LAKE
PRESCOTT
PRESCOTT NAT FOR
Clarkdale
Jerome
TUZIGOOT NAT MON
Happy Jack
Cottonwood
FOREST
MONTEZUMA CASTLE NAT MON
CAMP VERDE
YAVAPAI
Bagdad
Prescott
Humboldt
Mayer
Yarnell
SITGREAVES
Snowflake
Saint Johns
Heber
Payson
TONTO
Show Low
Lakeside
Pinetop
Parker
COLORADO RIVER IND RES
FORT APACHE INDIAN RESERVATION
McNary
APACHE
Whiteriver
Fort Apache
FOREST
Wickenburg
Wenden
Salome
Cave Creek
NATIONAL
FT MC DOWELL
Quartzsite
Peoria
Glendale
Phoenix
Avondale
Buckeye
TONTO NAT MON
SAN CARLOS INDIAN RESERVATION
FOREST
Superior
Queen Creek
Ehrenberg
GILA RIVER IND RES
GILA BEND IND RES
Gila Bend
Florence
Coolidge
CASA GRANDE NAT MON
Casa Grande
Sentinel
PAPAGO
Sells
Tucson
CORONADO
Bowie
Duncan

Arkansas

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
Fort Smith SMSA/ Fort Chaffee	Army	3@ 20 ea 1@ 5	operate in winter only	gas							burn gas, no APC
Pine Bluff SMSA/Pine Bluff Arsenal	Army	2@ 20 ea									gas, no APC
Washington County/ Fayetteville VA Hospital	VA	3@ 8.6ea.									gas and #2 oil
Little Rock SMSA/VA Hospital	VA	3@ 12.3ea.									gas and #2 oil
Little Rock Rock VA Hospital	VA	2@12.1ea. 2@18.7ea.									gas and #2 oil

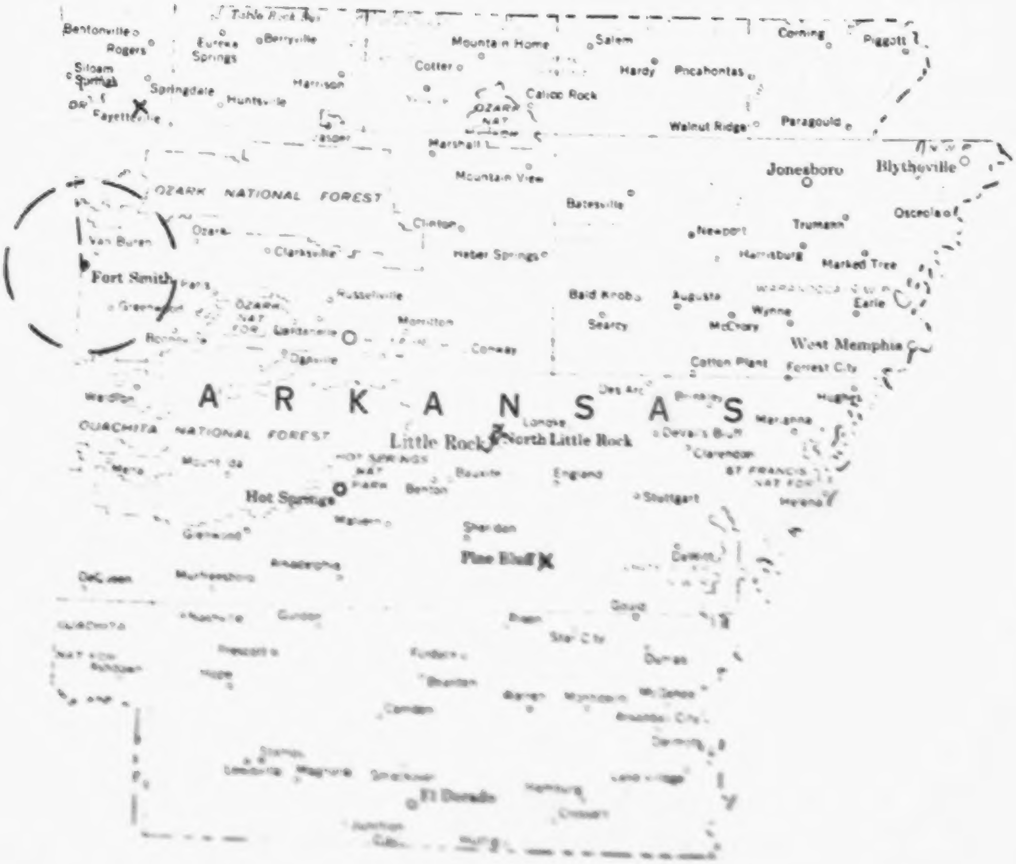


Table Rock Res
Bentonville
Rogers
Eureka Springs
Berryville
Mountain Home
Salem
Corning
Piggott
Siloam Springs
Springdale
Harrison
Cotter
Hardy
Pocahontas
Fayetteville
Huntsville
Calico Rock
OZARK NAT FOREST
Walnut Ridge
Paragould
Jasper
Marshall
Mountain View
Jonesboro
Blytheville
OZARK NATIONAL FOREST
Batesville
Van Buren
Ozark
Clinton
Newport
Trumann
Osceola
Clarksville
Heber Springs
Harrisburg
Marked Tree
Fort Smith
Paris
Russellville
Bald Knob
Augusta
Wynne
Earle
Greenwood
OZARK NAT FOR
Morrilton
Searcy
McCrory
Booneville
Dardanelle
Conway
West Memphis
Danville
Cotton Plant
Forrest City
Waldron
ARKANSAS
Des Arc
Brinkley
Hughes
Lonoke
Marianna
OUACHITA NATIONAL FOREST
Little Rock
North Little Rock
Devalls Bluff
Clarendon
Mena
Mount Ida
HOT SPRINGS NAT PARK
Bauxite
England
ST FRANCIS NAT FOR
Hot Springs
Benton
Stuttgart
Helena
Malvern
Sheridan
Glenwood
Pine Bluff
DeWitt
De Queen
Murfreesboro
Arkadelphia
Gould
OUACHITA NAT FOR
Okolona
Gurdon
Star City
Prescott
Fordyce
Dumas
Ashdown
Hope
Bearden
Warren
Monticello
McGehee
Camden
Arkansas City
Dermott
Stamps
Lewisville
Magnolia
Smackover
Lake Village
El Dorado
Hamburg
Crossett
Junction City
Huttig

California

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
Salinas-Monterey SMSA/Fort Ord	Army	2@ 24 ea.									gas; package boiler
San Francisco-Oakland SMSA/Presidio of San Francisco	Army	4@ 21 ea. 1@ 18 (inactive)									gas; no APC
Sacramento SMSA Sacramento Army Depot	Army	3@ 19 ea. 2@ 2 ea.									gas
San Francisco-Oakland SMSA/Alameda NAS	Navy	2@ 35 ea. 2@ 120 ea.									gas
San Bernadino-Riverside-Ontario SMSA/Norton AFB	Air Force	4@ 16.4 ea.									gas; no APC; space limitations
Sacramento SMSA McClellan AFB	Air Force	3@ 19 ea. 1@ 25 ea.									gas; no APC; space limitations
San Diego SMSA [illegible]	Air Force	5@ 21.8ea.									gas
Los Angeles-Long Beach SMSA/[illegible]	Air Force	2@ 33 ea.									gas
Fresno SMSA/VA Hospital	VA	3@ 97 ea.									gas and #2 oil

California

SMSA-County/ Place	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
San Francisco-Oakland SMSA Livermore VA Hospital	VA	2@ 12.2ea. 1@ 13.8									gas, # 2 oil
Los Angeles-Long Beach SMSA Long Beach VA Hospital	VA	3@ 24ea.									gas, # 2 oil
Los Angeles-Long Beach SMSA LA VA Hosp.	VA	1@ 32 3@ 40.7ea.									gas, # 2 oil
San Francisco-Oakland SMSA/ Martinez VA Hospital	VA	1@ 8 2@ 12 ea.									gas, # 2 oil
San Jose SMSA Palo Alto VA Hospital	VA	3@ 19.7ea.									gas, # 2 oil
San Jose SMSA /Menlo Park VA Hospital	VA	1@ 12.4 2@ 20.5ea.									gas, # 2 oil
San Deigo SMSA San Deigo VA Hospital	VA	24									oil
San Francisco-Oakland SMSA/ San Francisco VA Hospital	VA	3@ 15.3ea.									gas, #6 oil
Los Angeles-Long Beach SMSA San Fernando VA Hospital	VA	1@ 12.7 2@ 19 ea.									gas, # 2 oil

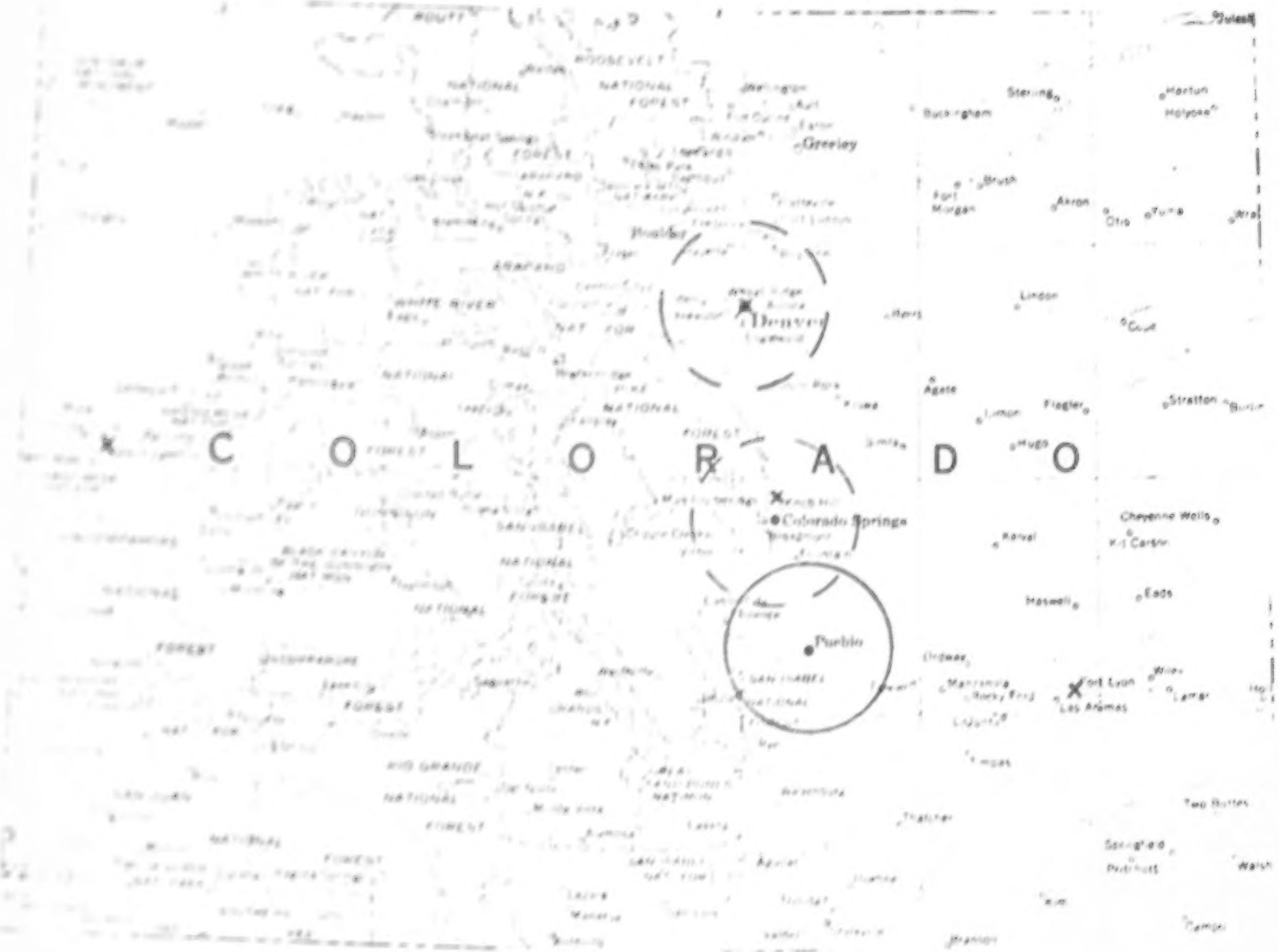
California

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Refuse Supply (tpd) Other Fed.	Refuse Supply (tpd) Com.	Notes
Los Angeles-Long Beach SMSA/Sepulveda VA Hospital	VA	1@ 15 & 2@ 22 ea.									gas, # 5 oil

Crescent City
Redwood Nat'l Park
Trinidad Head
Lava Beds Nat'l Mon.
Mt. Shasta (Vol.) 14,162 Ft.
Redding
Lassen Pk. (Vol.) 10,466 Ft.
Lassen Volcanic Nat'l Park
L. Almanor
Sacramento Valley
Pt. Arena
Santa Rosa
Bodega Head
Point Reyes Nat'l Seashore
Pt. Reyes
SACRAMENTO
Stockton
San Francisco
Berkeley
Oakland
San Jose
Pigeon Pt.
Monterey
Pt. Sur
Los Angeles
Long Beach
San Diego
Pacific Ocean

Colorado

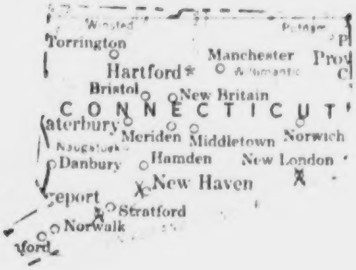
	SMSA-County/ Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
A	Pueblo SMSA/ Pueblo Army Depot	Army	2@ 50 ea. 3@ 12 ea.	annual ~ 410 summer-oil only	travelling grate stoker	1964 1958	60	50	33	143.4	218	M.C., refuse from Pueblo, Ft. Carson within 50 miles
B	Colorado Springs SMSA/ Fort Carson	Army	3@ 40 ea. 1@ 25	constant		1942			140			gas, #1 oil as standby, no APC
	Denver SMSA/ Army Med. Center	Army	2@ 52 ea. 2@ 60 ea.	avg:16 Jan. 58		1940						gas, no APC
C	Colorado Springs SMSA/ USAF Academy	Air Force	2@ 30 ea. 1@ 80 3@ 100 ea.									natural gas, no APC
	Denver SMSA/ Lowry AFB	Air Force	2@ 10 ea. 2@ 5 ea.	winter: 50,000#/hr summer: 12,000#/hr								1 of 10,000 #/hr boilers is coal but is not in use; others are gas
	Rocky Mountain Arsenal	Army	2@ 25 ea.									package boilers; gas
	Bent County/Ft. Lyon VA Hosp.	VA	1@ 10.4 1@ 20.3 1@ 19									gas, #2 oil
	Mesa County/ Grand Junction VA Hospital	VA	3@ 9.7 ea.									gas, #2 oil



COLORADO
ROUTT
ROOSEVELT
NATIONAL
FOREST
Wellington
Ault
Fort Collins
Eaton
Loveland
Greeley
Boulder
ARAPAHO
WHITE RIVER
NAT. FOR.
PIKE
NATIONAL
FOREST
Wheat Ridge
Aurora
Denver
Englewood
Colorado Springs
Pueblo
SAN ISABEL
NATIONAL
FOREST
UNCOMPAHGRE
RIO GRANDE
NATIONAL
FOREST
SAN JUAN
NATIONAL
FOREST
GUNNISON
Sterling
Buckingham
Haxtun
Holyoke
Brush
Fort Morgan
Akron
Otis
Yuma
Wray
Limon
Agate
Flagler
Stratton
Burlington
Hugo
Simla
Cheyenne Wells
Kit Carson
Kiowa
Haswell
Eads
Ordway
Manzanola
Rocky Ford
Fort Lyon
Las Animas
La Junta
Wiley
Lamar
Holly
Two Buttes
Thatcher
Springfield
Pritchett
Walsh
Campo
Branson
Trinidad
Aguilar
Walsenburg
Alamosa
La Veta
Del Norte
Monte Vista
Salida
Canon City
Leadville
Montrose
Delta
Grand Junction
Glenwood Springs
Meeker
Rifle
Craig
Steamboat Springs
Kremmling
Durango
Cortez
Gunnison

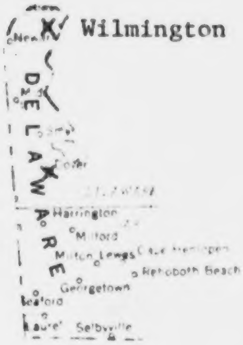
Connecticut

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
New Haven SMSA/ West Haven VA Hosp.	VA	2@ 31.3ea. 1@ 16.5ea.									gas, #2 oil
/New-ington VA Hosp	VA	1@ 6.3 2@ 12.5 ea.									#6 oil
Bridgeport SMSA /[illegible]	AirForce	3@ 18 ea.									#6 oil
New London-Groton-Norwich SMSA/Sub Base-Groton	Navy	5@ 75 ea.									#6 oil; boilers were built for coal but coal was never burned; No APC


Winsted
Putnam
Torrington
Manchester
Prov
Hartford
Willimantic
Bristol
New Britain
CONNECTICUT
aterbury
Naugatuck
Meriden
Middletown
Norwich
Danbury
Hamden
New London
New Haven
eport
Stratford
Norwalk
ford

Delaware

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
C	Wilmington SMSA/VA Hospital	VA	3@ 18.8 ea.									#6 oil
	Kent County/Dover AFB	Air Force	4@ 50 ea									#6 oil, one package boiler, no APC


Wilmington
Newark
DELAWARE
Dover
Harrington
Milford
Milton
Lewes
Cape Henlopen
Rehoboth Beach
Georgetown
Seaford
Laurel
Selbyville

District of Columbia

	SMSA-County/ Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
A/ B	Washington/ Navy Yard	Navy	1 @ 120 1 @ 120 1 @ 150	avg. 52.8	stoker	1917	53.3	50	10.8	188.6		coal oil and gas
A/ C	Washington/ Central Heating & Refrig. Plant	GSA	4 @ 215 ea.	avg. 385* op. 9 mo./yr.	stoker	1933	382	50		188.6	1814	have ESPs, space limited
			2 @ 400 ea.			1974						#6 fuel oil (not yet in operation)
	Washington/ West Heating Plant	GSA	3 @ 215 ea.	op. 9 mo./yr.	stoker	1948	287	50		188.6	1814	have ESP's
			2 @ 215 ea.			1968						#6 fuel oil
	Washington/ Boiler Plant for Capital Bldg.		3 @ 110 ea. 4 @ 50 ea.	max:250	stoker	1951	146.7	50		188.6		coal; ESP's-85% oil are limited on space
C	Washington/ Walter Reed AMC	Army	2@ 64 ea. 1 @ 8.1									package type boilers oil
	Washington/ North Heating Plant	GSA	1 @ 35 2 @ 30 ea.	avg: 14								oil/gas

* total steam demand supplied by Central and West Heating Plants

Florida

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
Jacksonville SMSA/Naval Air Station	Navy	4@ 45 ea.									natural gas
Jacksonville SMSA/Naval Hospital	Navy	2@ 20 ea.									natural gas
Jacksonville SMSA/Newport Naval Station	Navy										#6 oil
Pensacola SMSA Public Works Center	Navy	2@ 125 ea.									natural gas
Pensacola SMSA Whiting Field NAS	Navy	2@ 25 ea.									designed for gas; firing #6 oil currently
Bay Lines VA Hospital	VA	2@ 10.9ea 1@ 10 1@ 11.4									gas; no.2 oil
Columbia County /Lake City VA Hospital	VA	2@ 10.5ea 1@ 6.4									#6 oil
Miami SMSA/VA Hospital	VA	3@ 20 ea.									#2 oil
Tampa-St. Petersburg SMSA/Tampa VA Hospital	VA	3@ 18 ea.									oil

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A
Pensacola
Santa Rosa Island
Crestview
De Funiak Springs
Fort Walton Beach
Niceville
Bonifay
Chipley
Marianna
Blountstown
Quincy
Tallahassee
Lynn Haven
Panama City
Port St Joe
Cape San Blas
Carrabelle
Apalachicola
St George Island
St Marks
Monticello
Madison
Perry
Jasper
Live Oak
Lake City
Macclenny
Baldwin
Jacksonville
Jacksonville Beach
Fernandina Beach
Orange Park
Green Cove Springs
St Augustine
Palatka
High Springs
Gainesville
Trenton
Cross City
Chiefland
Williston
Cedar Key
Dunnellon
Ocala
Bunnell
Ormond Beach
Daytona Beach
New Smyrna Beach
Inverness
Leesburg
Bushnell
Brooksville
Clermont
Sanford
Orlando
Winter Park
Dade City
Tarpon Springs
Clearwater
St Petersburg
Tampa
Lakeland
Gulfport
Mulberry
Bartow
Ft Meade
Avon Park
Palmetto
Bradenton
Sarasota
Sebring
Wauchula
Venice
Arcadia
Lake Istokpoga
Ft Pierce
Okeechobee
Englewood
Punta Gorda
Boca Grande
BRIGHTON IND RES
La Belle
Fort Myers
Sanibel Island
West Palm Beach
Immokalee
Naples
BIG CYPRESS IND RES
Cape Romano
Hollywood
Fort Lauderdale
Coral Gables
Miami
Miami Beach
Everglades
Key West
STRAIT

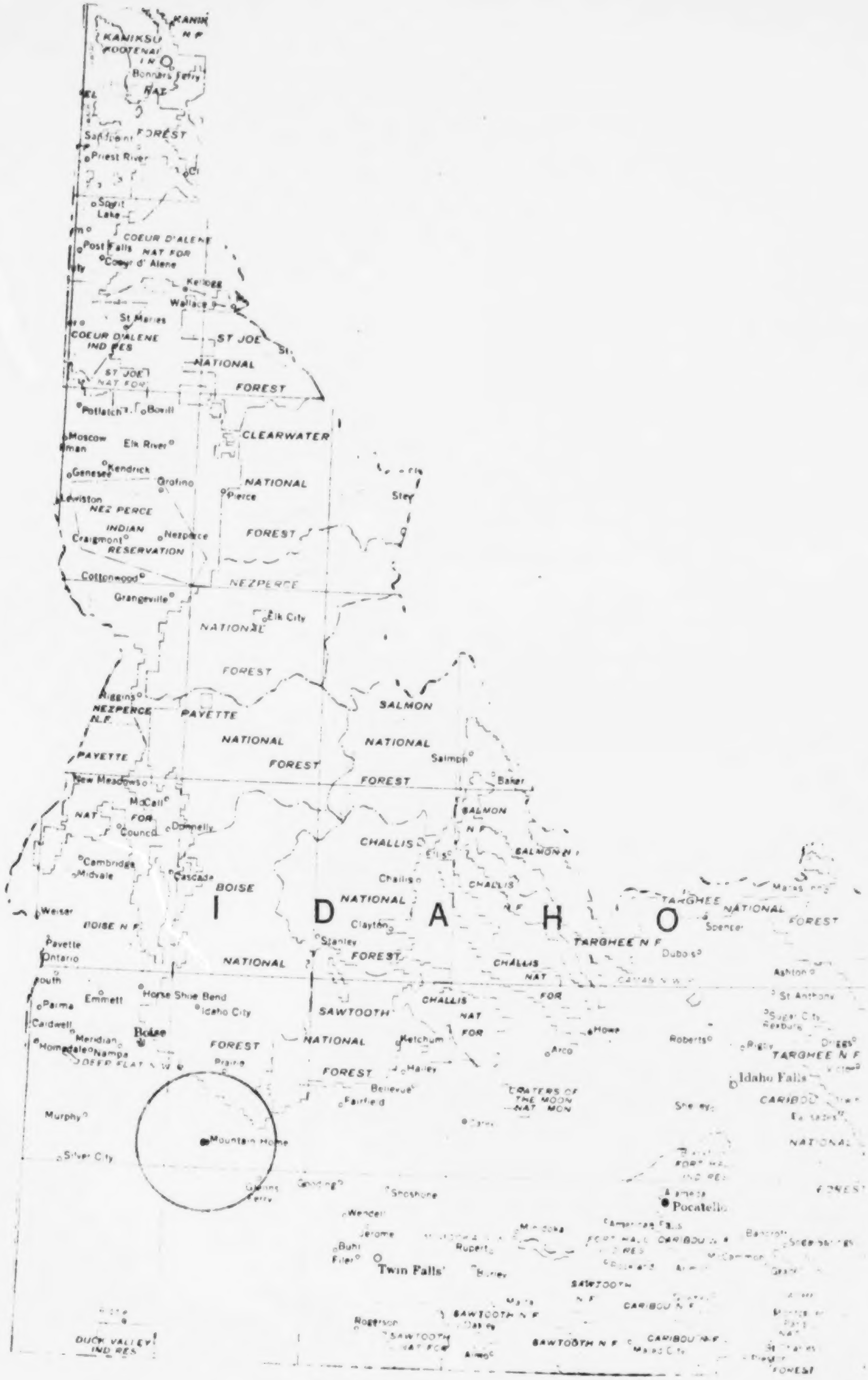
Georgia

SMSA-County/ Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
Macon SMSA/ Robins AFB	Air Force	3 @ 55 ea 2 @ 100 ea 2 @ 7 ea 1 @ 20 1 @ 25									gas; no APC; no room for conversion
Atlanta SMSA/ ACFL	Air Force	4 @ 100 ea 2 @ 50 ea									gas; 2 boilers @ 50,000 lb are inactive, no APC
Atlanta SMSA/ VA Hospital	VA	1 @ 40 2 @ 20 ea									gas, #6 oil
Augusta SMSA/ Zenwood VA Hospital	VA	20.6 14.4 21.1									gas, #5 oil
Augusta SMSA/ Forest Hill VA Hospital	VA	86 2 @ 12 ea									gas, #5 oil
Laurens County Dilblin VA Hospital	VA	4 @ 17.8 ea									gas, #2 oil
Augusta SMSA/ Ft. Gordon	Army	5 @ 29 ea									gas, no APC
Columbus SMSA/ Ft. Benning	Army	3 @ 57 ea									gas, no APC, no space available

GEORGIA
Dalton
Blue Ridge
Clayton
CHATTAHOOCHEE NATIONAL FOREST
La Fayette
Chatsworth
Ellijay
Dahlonega
Demorest
Toccoa
Summerville
Calhoun
CHATTAHOOCHEE N.F.
Rome
Mount Berry
Waleska
Cartersville
Canton
Gainesville
Hartwell
Buford
Commerce
Cedartown
Winder
Elberton
Marietta
Lawrenceville
Athens
Atlanta
North Atlanta
Bremen
Decatur
Douglasville
Monroe
OCONEE NAT FOR
Washington
East Point
Covington
Carrollton
Madison
Greensboro
Jonesboro
OCONEE NAT FOR
Newnan
Augusta
Eatonton
Griffin
Monticello
Sparta
Wrens
La Grange
Forsyth
Milledgeville
Barnesville
CHATTAHOOCHEE NAT FOR
Sandersville
Louisville
Waynesboro
West Point
Thomaston
Manchester
Macon
Wadley
Millen
Talbotton
Wrightsville
Sylvania
Fort Valley
Warner Robins
Swainsboro
Columbus
Dublin
Perry
Cochran
Metter
Statesboro
Buena Vista
Hawkinsville
Vidalia
Lumpkin
Americus
Vienna
Eastman
McRae
Pembroke
Claxton
Reidsville
Savannah
FT PULASKI NAT MON
Cuthbert
Dawson
Cordele
Hazlehurst
Glennville
Baxley
Ashburn
Fitzgerald
Ludowici
Albany
Sylvester
Ocilla
Alma
Jesup
Tifton
Douglas
Blakely
Darien
Camilla
Norman Park
Pearson
Pelham
Moultrie
Adel
Nashville
Waycross
Donalsonville
Brunswick
Lakeland
Homerville
Bainbridge
Cairo
Thomasville
Valdosta
Chattahoochee
Quitman

Idaho

	SMSA-County/ Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
A	Elmor County/ Mt. Home AFB	Air Force	3 @ 31 ea 1 @ 65	winter: 62	Stokers	1954-59	70	50	30.9	0.5	39	MC - 85%; ESP installed but not operating; refuse from county
C	Bannock County/ Federal Office Bldg.	GSA	2		Stoker							inactive
	Boise SMSA/ VA Hospital	VA	10.1 2 @ 11.8 ea									gas, #2 oil

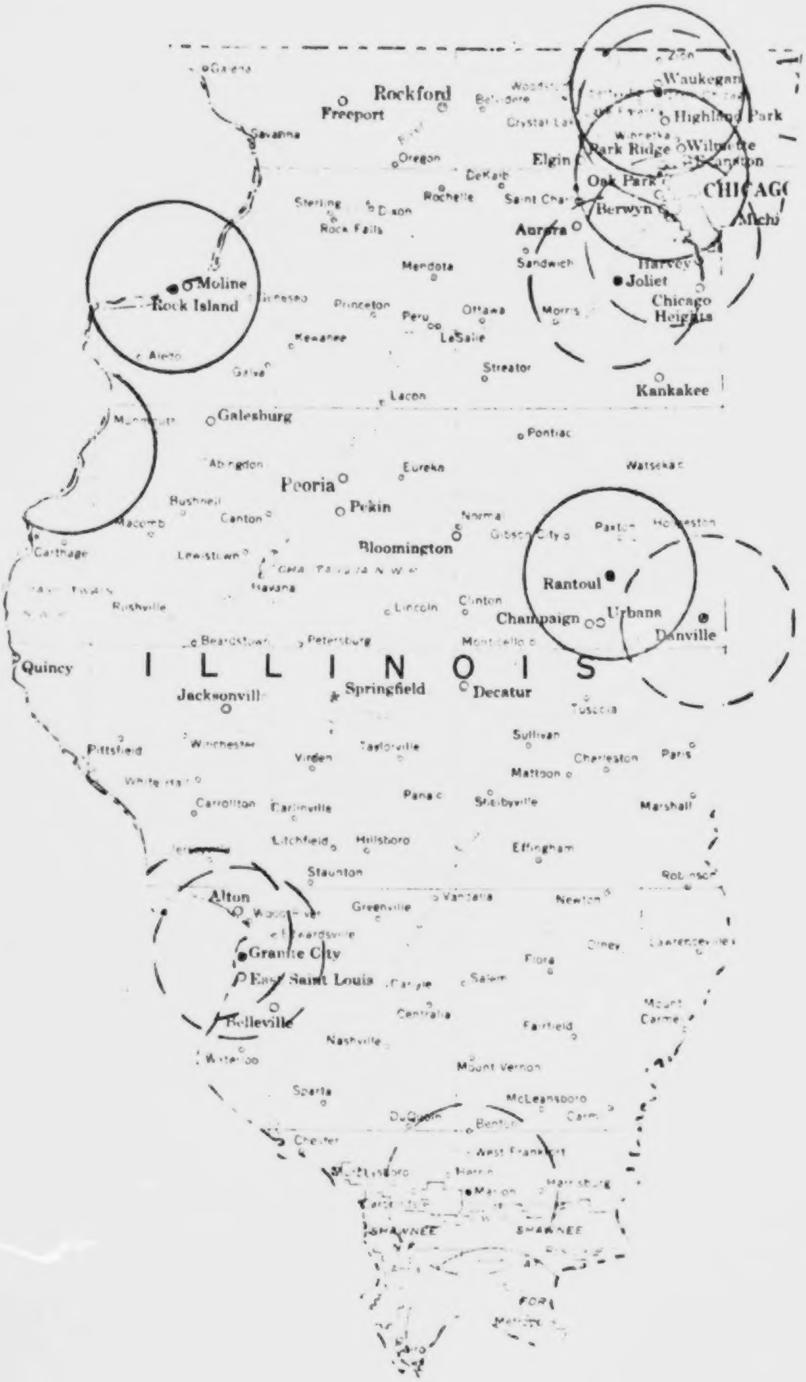

IDAHO
KANIKSU N.F.
KOOTENAI IND.
Bonners Ferry
Sandpoint
FOREST
Priest River
Spirit Lake
COEUR D'ALENE NAT FOR
Post Falls
Coeur d' Alene
Kellogg
Wallace
St Maries
COEUR D'ALENE IND RES
ST JOE NATIONAL FOREST
ST JOE NAT FOR
Potlatch
Bovill
Moscow
Elk River
CLEARWATER NATIONAL FOREST
Genesee
Kendrick
Orofino
Pierce
Lewiston
NEZ PERCE INDIAN RESERVATION
Craigmont
Nezperce
Cottonwood
Grangeville
NEZPERCE NATIONAL FOREST
Elk City
Riggins
NEZPERCE N.F.
PAYETTE NATIONAL FOREST
PAYETTE
SALMON NATIONAL FOREST
Salmon
Baker
New Meadows
McCall
NAT FOR
Council
Donnelly
CHALLIS
SALMON N.F.
Cambridge
Midvale
Cascade
BOISE NATIONAL
Challis
CHALLIS NATIONAL FOREST
Weiser
BOISE N.F.
Clayton
Stanley
TARGHEE N.F.
TARGHEE NATIONAL FOREST
Spencer
Dubois
Payette
Ontario
Emmett
Horse Shoe Bend
Idaho City
SAWTOOTH NATIONAL FOREST
CHALLIS NAT FOR
Ashton
St Anthony
Parma
Caldwell
Meridian
Boise
Nampa
Homedale
Ketchum
Howe
Arco
Roberts
Rexburg
Rigby
Driggs
Prairie
Hailey
Idaho Falls
CARIBOU
Bellevue
Fairfield
CRATERS OF THE MOON NAT MON
Shelley
Murphy
Mountain Home
NATIONAL
Silver City
FORT HALL IND RES
Glenns Ferry
Gooding
Shoshone
Pocatello
Wendell
Jerome
Minidoka
American Falls
Buhl
Filer
Twin Falls
Rupert
Burley
CARIBOU N.F.
Bancroft
McCammon
SAWTOOTH N.F.
Malta
Rogerson
SAWTOOTH NAT FOR
Oakley
Albion
Malad City
DUCK VALLEY IND RES
FOREST

Illinois

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
A	Davenport - Rock Island-Moline SMSA Rock Island Arsenal	Army	2@40.2 ea. 1@50.25 1@32.2	300 winter 60 .summer	Stokers	1941 1963 1968	107	50	trash 7.5 Wood6.7	7.6	113	very crowded; designing APC
	Chicago SMSA/ 928th	Air Force	4@44.8 ea.	under 18	Stoker	1943	31	50	3.2	61	7885	no APC; planning to abandon coal boiler
	Champaign-Urbana SMSA Chanute AFB	Air Force	3@33.5 ea.	134	Stoker	1939	59.5	50	40.8	2.9	57.5	waste from Rantoul
B	Vermilion Cty. Danville VA Hospital	VA	3@25 ea.						0.5			gas; no APC; have an incinerator
	Williamson Cty. Marion VA Hospital	VA	3@25 ea.						0.5			gas; no APC; have an incinerator
	St.Louis SMSA Granite City Army Depot	Army	2@20 ea.	40 winter only								no APC; oil
	Chicago SMSA Joliet Army Ammo. Plant	Army	3@100 ea.									gas; 2 are inactive; no APC
	Chicago SMSA Ft.Sheridan	Army	[illegible]40 ea.	80 summer: 7								gas and oil

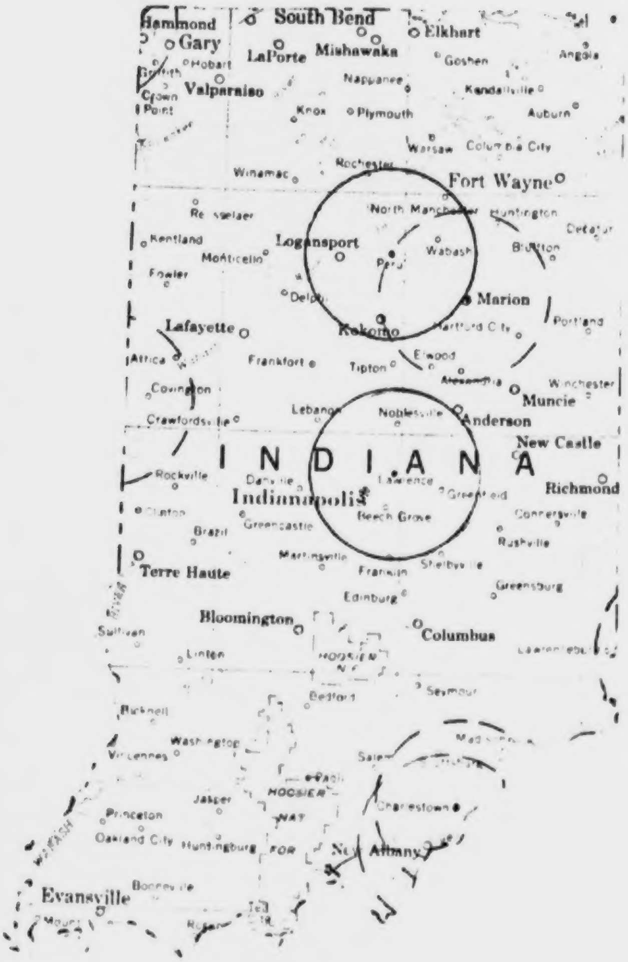
Illinois

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
Chicago SMSA Argon National Lab.	ERDA	170									3 oil boilers plus 1 converted coal boiler
Carroll Cty./ Savanna Army Depot	Army	2@24 ea.									package boilers
St. Louis SMSA Scott AFB	Air Force	2@85 ea. 2@40 ea.									#6 oil; no APC
Chicago SMSA Naval Air Station	Navy	2@30 ea.									gas; no APC
Chicago SMSA Public Works Center	Navy	2@20 ea.									#6 oil, no APC
Chicago SMSA Research Center	VA	3@28.6 ea.									gas, #6 oil


ILLINOIS
Galena
Rockford
Freeport
Belvidere
Savanna
Waukegan
Highland Park
Crystal Lake
Elgin
Park Ridge
Wilmette
Evanston
Oregon
DeKalb
Oak Park
CHICAGO
Sterling
Dixon
Rock Falls
Rochelle
Saint Charles
Berwyn
Aurora
Mendota
Sandwich
Harvey
Joliet
Moline
Rock Island
Geneseo
Princeton
Peru
LaSalle
Ottawa
Morris
Chicago Heights
Aledo
Kewanee
Galva
Streator
Kankakee
Lacon
Galesburg
Monmouth
Pontiac
Abingdon
Peoria
Eureka
Watseka
Bushnell
Macomb
Canton
Pekin
Normal
Gibson City
Paxton
Hoopeston
Carthage
Lewistown
Bloomington
Havana
Rantoul
Rushville
Lincoln
Clinton
Champaign
Urbana
Danville
Beardstown
Petersburg
Monticello
Quincy
Jacksonville
Springfield
Decatur
Tuscola
Pittsfield
Winchester
Virden
Taylorville
Sullivan
Charleston
Paris
Mattoon
Carrollton
Carlinville
Pana
Shelbyville
Marshall
Litchfield
Hillsboro
Effingham
Staunton
Robinson
Alton
Wood River
Greenville
Vandalia
Newton
Edwardsville
Granite City
Olney
Lawrenceville
East Saint Louis
Carlyle
Salem
Flora
Belleville
Centralia
Fairfield
Mount Carmel
Nashville
Waterloo
Mount Vernon
Sparta
McLeansboro
Du Quoin
Benton
Carmi
Chester
West Frankfort
Murphysboro
Harrisburg
Marion
Carbondale
SHAWNEE
Cairo
Metropolis

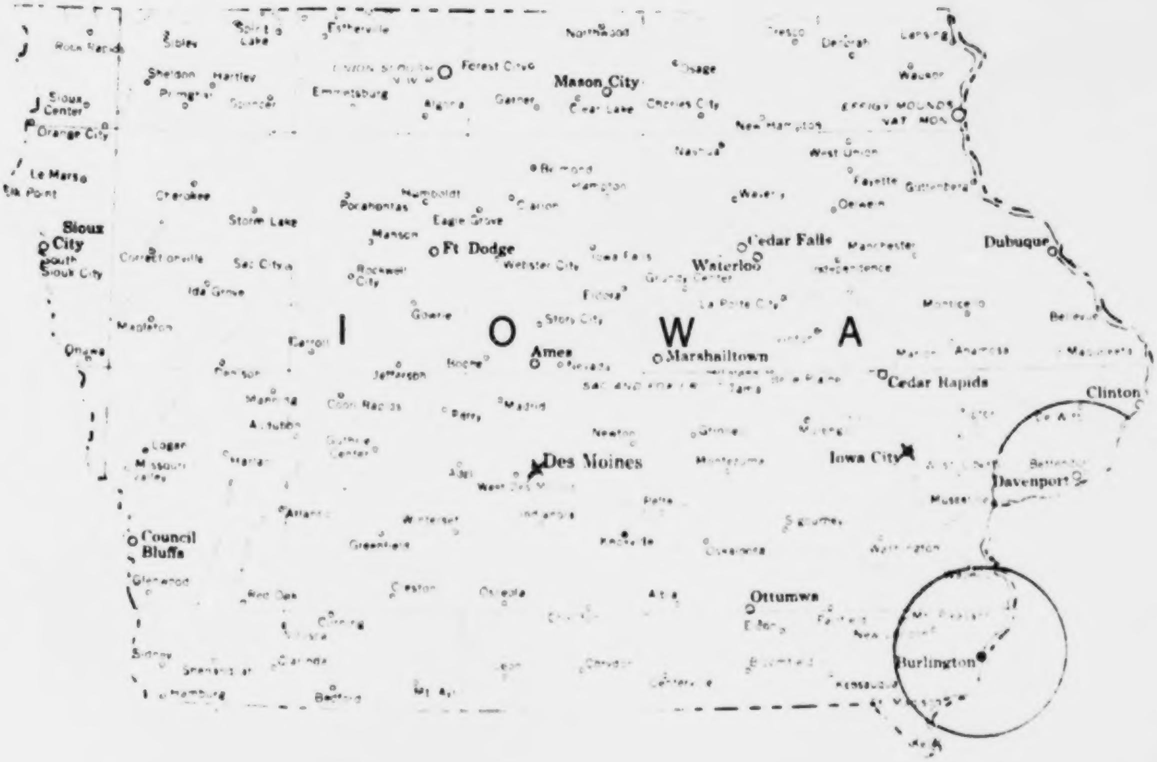
Indiana

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
A	Indianapolis SMSA/Ft.B. Harrison	Army	7@ 18 ea.	144 max	stoker	1952 1968	30	50	48	17.5		APC by 1977
	Miami County/ Grissom AFB	Air Force	2@ 40 ea.	35 winter load	stoker	1955 1959	35.5	50	20	0.7	24.5	limited space, no APC; waste from county
B	Grant County/ VA Hospital	VA	3@ 30 ea.	max:60				4				gas, no APC, have an incinerator
	Louisville SMSA/Indiana Army Ammo. Plant	Army	3@ 24 ea.					3				#2 oil, no APC
	Louisville SMSA/Jeffersonville, Ind. Steam Plant	GSA	34 9 2@17 ea.			1941 1941 1941						not in use oil/gas no APC oil/gas
C	Louisville SMSA/Jefferson Proving Grounds	Army	3@ 26 ea.									package boilers; oil
	Parke County/ Newport Army Ammo Plant	Army	2@ 60 ea.									oil, package boilers
	Indianapolis SMSA/Cold Springs VA Hospital	VA	7 6.8 13									#6 oil


Hammond
South Bend
Elkhart
Gary
LaPorte
Mishawaka
Goshen
Angola
Griffith
Hobart
Valparaiso
Nappanee
Kendallville
Crown Point
Knox
Plymouth
Auburn
Warsaw
Columbia City
Winamac
Rochester
Fort Wayne
Rensselaer
North Manchester
Huntington
Decatur
Kentland
Logansport
Wabash
Bluffton
Monticello
Peru
Fowler
Delphi
Marion
Lafayette
Kokomo
Hartford City
Portland
Attica
Frankfort
Tipton
Elwood
Alexandria
Winchester
Covington
Muncie
Crawfordsville
Lebanon
Noblesville
Anderson
New Castle
INDIANA
Rockville
Danville
Lawrence
Greenfield
Richmond
Indianapolis
Clinton
Brazil
Greencastle
Beech Grove
Connersville
Rushville
Martinsville
Franklin
Shelbyville
Terre Haute
Greensburg
Edinburg
Bloomington
Columbus
Sullivan
Linton
HOOSIER N F
Lawrenceburg
Seymour
Bedford
Bicknell
Washington
Madison
Vincennes
Salem
Paoli
HOOSIER
Jasper
Charlestown
Princeton
WAY
Oakland City
Huntingburg
FOR
New Albany
WABASH
RIVER
Evansville
Boonville
Mount

Iowa

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
A	Des Moines County/Iowa Army Ammo Plant	Army	4@ 45 ea	225 Winter 80 Summer	p.c.	1940	88	50	20	0.3	73	no APC
C	Johnson County/Knoxville VA Hospital	VA	4@ 21.2 ea									oil
	Marion County Iowa City VA Hospital	VA	2@ 12 ea									oil
	Des Moines SMSA/VA Hospital	VA	2@ 14 ea 20 ea									gas, #2 oil


I O W A
Rock Rapids
Sibley
Spirit Lake
Estherville
Northwood
Cresco
Decorah
Lansing
Sheldon
Hartley
Primghar
Spencer
Emmetsburg
Forest City
Mason City
Osage
Waukon
Sioux Center
Orange City
Algona
Garner
Clear Lake
Charles City
New Hampton
Effigy Mounds Nat. Mon.
Nashua
West Union
Le Mars
Elk Point
Cherokee
Storm Lake
Pocahontas
Humboldt
Belmond
Hampton
Clarion
Waverly
Fayette
Oelwein
Guttenberg
Sioux City
South Sioux City
Eagle Grove
Manson
Ft Dodge
Webster City
Iowa Falls
Cedar Falls
Waterloo
Manchester
Dubuque
Correctionville
Sac City
Rockwell City
Ida Grove
Grundy Center
Eldora
Independence
La Porte City
Monticello
Mapleton
Goerie
Story City
Bellevue
Carroll
Ames
Nevada
Marshalltown
Marion
Anamosa
Maquoketa
Onawa
Denison
Jefferson
Boone
Tama
Belle Plaine
Cedar Rapids
Clinton
Manning
Coon Rapids
Perry
Madrid
Audubon
Newton
Grinnell
Logan
Missouri Valley
Harlan
Guthrie Center
Des Moines
Adel
West Des Moines
Montezuma
Iowa City
Bettendorf
Davenport
Atlantic
Winterset
Indianola
Pella
Knoxville
Oskaloosa
Sigourney
Muscatine
Washington
Council Bluffs
Greenfield
Glenwood
Red Oak
Creston
Osceola
Chariton
Albia
Ottumwa
Corning
Villisca
Fairfield
Mt. Pleasant
Eldon
Sidney
Shenandoah
Clarinda
Leon
Corydon
Centerville
Bloomfield
Keosauqua
Burlington
Ft. Madison
Hamburg
Bedford
Mt. Ayr

Kansas

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
Wichita SMSA/ ACFS	Air Force	2@ 60 ea. 2@ 20 ea. 5@ 28 ea.									gas, package boilers
Leavenworth County/VA Hospital	VA	2@ 25 ea. 1@ 30									gas, #5 oil
Leavenworth County/Ft. Leavenworth	Army	7 16 4@ 22 ea.									gas; package boilers
Geary County/ Ft. Riley	Army	2@ 33 ea.									gas; no APC
Topeka SMSA/ VA Hospital	VA	8 18 2@ 26 ea.									gas; #2 oil

KANSAS
Topeka
Kansas City
Leavenworth
Lawrence
Wichita
Hutchinson
Salina
Emporia
Manhattan
Abilene
Ottawa
Olathe
Atchison
Council Grove
El Dorado
Augusta
Winfield
Arkansas City
Wellington
Newton
McPherson
Lindsborg
Ellsworth
Great Bend
Hays
Russell
Larned
Pratt
Dodge City
Garden City
Scott City
Ness City
Colby
Goodland
St Francis
Norton
Concordia
Belleville
Washington
Marysville
Seneca
Hiawatha
Holton
Iola
Chanute
Parsons
Independence
Coffeyville
Pittsburg
Ft Scott
Columbus
Baxter Springs
Garnett
Burlington
Eureka
Howard
Sedan
Medicine Lodge
Kingman
Anthony
Harper
Coldwater
Ashland
Meade
Liberal
Hugoton
Sublette
Cimarron
Syracuse
Lakin
Tribune
Leoti
Sharon Springs
Oakley
Atwood
Smith Center
Mankato
Beloit
Osborne
Stockton
Hill City
Phillipsburg
Lincoln
Minneapolis
Clay Center
Junction City
Wamego
St Marys
Herington
Marion
Peabody
Florence
Sterling
Lyons
Ellinwood
Hoisington
St John
Stafford
Greensburg
Kinsley
La Crosse
Wa Keeney
Gove
Dighton
Hoxie
Ellis
Wilson
Belleville
Clyde
Blue Rapids
Frankfort
Sabetha
Elwood
Tonganoxie
Baldwin City
Paola
Osawatomie
Pleasanton
Girard
Erie
Neodesha
Fredonia
Humboldt
Yates Center
Chetopa
Caney
Cherryvale
Oswego
Cedar Vale

Kentucky

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
A	Muhlenberg County/Paradise	TVA	3@ 6786 MW (ea)	58% of design	p.c.	1963 (2) 1969						wet bottom; ESP-95%
	McCracken County/Shawnee	TVA	10 @ 175 M ea	68% of design	p.c.	3-1953 4-1954 2-1955 1-1956						m.c./ESP-60/95
B	Louisville SMSA/VA Hospital	VA	3 @ 19 ea	4 to 25					20-30			gas
	Christian County/Ft. Campbell	Army	2@ 14 ea 3@ 21 ea 3@ 25 ea									gas, oil no APC
	Harden County/Ft. Knox	Army	3@ 34 ea 2@ 25 ea			1955 to 1967						gas, oil planning APC
	Kenton County/Ft. Thomas VA Hospital	VA	2@ 31 ea 2@ 45 ea									gas, #2 oil
	Lexington SMSA/VA Hospital	VA	3@ 253 ea									gas, #2 oil
	Lexington SMSA/VA Hospital	VA	3@ 17.25 ea									gas, #2 oil

KENTUCKY
Covington
Carrollton
Falmouth
Augusta
Maysville
Ashland
Catlettsburg
Grayson
Louisa
Owenton
Cynthiana
Paris
Georgetown
Frankfort
Versailles
Lexington
Mount Sterling
Morehead
Winchester
Nicholasville
Richmond
Irvine
Lancaster
Berea
Stanford
Danville
Harrodsburg
Lebanon
Bardstown
Lawrenceburg
Shelbyville
La Grange
Louisville
Brandenburg
Cloverport
Elizabethtown
Hodgenville
Leitchfield
Owensboro
Henderson
Morganfield
Sturgis
Providence
Marion
Madisonville
Dawson Springs
Central City
Greenville
Hartford
Eddyville
Princeton
Paducah
Benton
Mayfield
Murray
Cadiz
Hopkinsville
Elkton
Russellville
Franklin
Scottsville
Bowling Green
MAMMOTH CAVE NAT PARK
Horse Cave
Glasgow
Greensburg
Campbellsville
Columbia
Tompkinsville
Burkesville
Albany
Somerset
Monticello
Mount Vernon
Williamsburg
London
Corbin
Barbourville
Pineville
Middlesboro
Manchester
Beattyville
Jackson
Salyersville
Paintsville
Prestonsburg
Pikeville
Wheelwright
Hazard
Jenkins
JEFFERSON NAT FOR
Lynch
Harlan
NATIONAL FOREST

Louisiana

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Refuse Supply (tpd) Other Fed.	Refuse Supply (tpd) Com.	Notes
C	New Orleans SMSA/VA Hosp.	VA	3@ 19 ea.									gas, #2 oil

Vivian
Haynesville
Homer
KISATCHIE NAT FOR
Minden
Farmerville
Bastrop
Lake Providence
Arcadia
Ruston
Bossier City
Shreveport
West Monroe
Monroe
Rayville
Tallulah
Jonesboro
Winnsboro
Mansfield
Coushatta
Columbia
Winnfield
Saint Joseph
Natchitoches
KISATCHIE NAT FOR
Harrisonburg
Jena
Many
KISATCHIE NAT FOR
Colfax
LOUISIANA
Pineville
Alexandria
KISATCHIE NAT FOR
Leesville
KISATCHIE NAT FOR
Marksville
DeRidder
Glenmora
Bunkie
Jackson
Clinton
Franklinton
Merryville
Oakdale
Ville Platte
Amite
Bogalusa
Oberlin
New Roads
Eunice
Opelousas
Hammond
Covington
DeQuincy
Kinder
Baton Rouge
Slidell
Sulphur
Welsh
Rayne
Lafayette
Plaquemine
Lake Charles
Jennings
Crowley
Saint Martinville
New Iberia
Kaplan
Jeanerette
Donaldsonville
Kenner
New Orleans
Abbeville
Napoleonville
Gretna
Cameron
CHITIMACHA I R
Franklin
Thibodaux
Morgan City
Houma
Pointe a la Hache
Marsh Island
SHELL KEYS N W R
Buras
Grand Isle

Maine

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
A	Aroostock County/ Loring AFB	Air Force	3 @ 66 ea	max: 185	travelling grate stoker	1954 2-1956	88	50	28.1	1.2	211	waste from county; have ESF
C	Cumberland County Naval Air Station	Navy	2 @ 60 2 @ 66									#6 fuel oil
	York County/ Naval Shipyard	Navy	3 @ 120 ea									#6 fuel oil
	Kennebec County/VA Hospital	VA	3 @ 20 ea									#6 fuel oil

MAINE
Saint Francis
Fort Kent
Van Buren
Eagle Lake
Caribou
Fort Fairfield
Presque Isle
Ashland
Mars Hill
Houlton
Chesuncook
Patten
Rockwood
Millinocket
Greenville
Dover Foxcroft
Woodland
Dexter
Old Town
Bangor
Orono
Madison
Pittsfield
Skowhegan
Machias
Farmington
Ellsworth
Waterville
Bucksport
Great Wass Island
Rumford
Belfast
ACADIA
Livermore
Augusta
Bar Harbor
Mount Desert Island
Norway
NAT.
Camden
Swans Island
PARK
Auburn
Lewiston
Wiscasset
Rockland
Fryeburg
Brunswick
Bath
Matinicus Island
Westbrook
Portland
Cape Elizabeth
Sanford
Biddeford
Kennebunk
Somersworth
Kittery
Portsmouth

Maryland

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
B	Baltimore SMSA Fort Meade	Army	5 @ 13.8 ea 3 @ 45 ea. 3 @ 21 ea.	min: 10 max: 30								2-gas; 9 oil
C	Georges County/ Andrews AFB	Air Force	3 @ 33 ea. 2 @ 52 ea. 2 @ 29.5 ea									#6 fuel oil
A	Baltimore SMSA Naval Academy	Navy	3 @ 100 ea									natural gas; #2 fuel oil as alternat
	Baltimore SMSA Naval Ship R&D Center	Navy	1 @ 20 1 @ 25 2 @ 40 ea									natural gas; #2 fuel oil as alternat
	Baltimore SMSA Aberdeen Proving Ground	Army	3 @ 53 ea. 1 @ 20 1 @ 2 2 @ 35 ea. 1 @ 17 1 @ 15 1 @ 11 5 @ 25 ea. 3 @ 91 ea.									oil; 2,000, 17,000 & 20,000 lb/hr boilers are package boilers
	Frederick County/Ft. Detrick	Army	1 @ 130 2 @ 66 ea 2 @ 33 ea									oil; limited space

Maryland

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
C Baltimore SMSA VA Hospital	VA	3 @ 16.7 ea									gas and #2 oil
Baltimore SMSA Fort Howard VA Hospital	VA	3 @ 12.1 ea									gas and #2 oil
Wash.,D.C. SMSA/Suitland Heating & Refrig.Plant	GSA	3 @ 35 ea.	operate year-round								#2 fuel oil
Baltimore SMSA/Ft. Meade Heating Plant	GSA	1 @ 66 3 @ 60 ea	avg. 15.2								#2 fuel oil
Washington,D.C SMSA/Germantown Heating Plant	GSA	1 @ 8 2 @ 14 ea.	avg. 5								#2 fuel oil

MARYLAND
Frostburg
Cumberland
Westernport
Oakland
Hagerstown
Frederick
Westminster
Baltimore
Havre de Grace
Elkton
Chestertown
Centreville
Rockville
Silver Spring
WASHINGTON
Annapolis
Denton
Easton
Upper Marlboro
Prince Frederick
Cambridge
CHESAPEAKE & OHIO CANAL NAT. MON.
BLACKWATER N.W.R.
Salisbury
Ocean City
Snow Hill
Princess Anne
Leonardtown
Crisfield

Massachusetts

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
A	Barnstable County/ Otis AFB	Air Force	3 @ 31.2 ea.	2 on in winter	Spreader Stoker	2-1954	41.5	50	31.1	1.8	8.5	Waste from North Falmouth
B	Hampton County Westover AFB	Air Force	2 @ 16.3 ea 2 @ 23 ea	avg. 48,000 lb/hr								oil
C	Boston SMSA/ Watertown Arsenal	Army	3 @ 45 ea. 1 @ 22									oil
	Boston SMSA/ Natick Labs	Army	3 @ 20 ea.									oil; one boiler is inactive
	Boston SMSA/ Hanscom Field	Air Force	3 @ 53 ea. 1 @ 52									#6 fuel oil
	Boston SMSA/ AF Plant 28 (ACGJ)	Air Force	3 @ 60 ea. total									#6 fuel oil
	Boston SMSA/ Bedford VA Hospital	VA	1 @ 21 1 @ 21.9 2 @ 35 ea.									#6 fuel oil
	Boston SMSA/ Brockton VA Hospital	VA	1 @ 22.6 2 @ 30.4 ea									#6 fuel oil
	Springfield-Chicopee-Holyoke SMSA/Northampton VA Hosp	VA	1 @ 11 2 @ 19 ea.									#6 fuel oil
	Boston SMSA/ W.Roxbury VA Hospital	VA	1 @ 16.5 2 @ 31.3 ea									gas and #2 oil

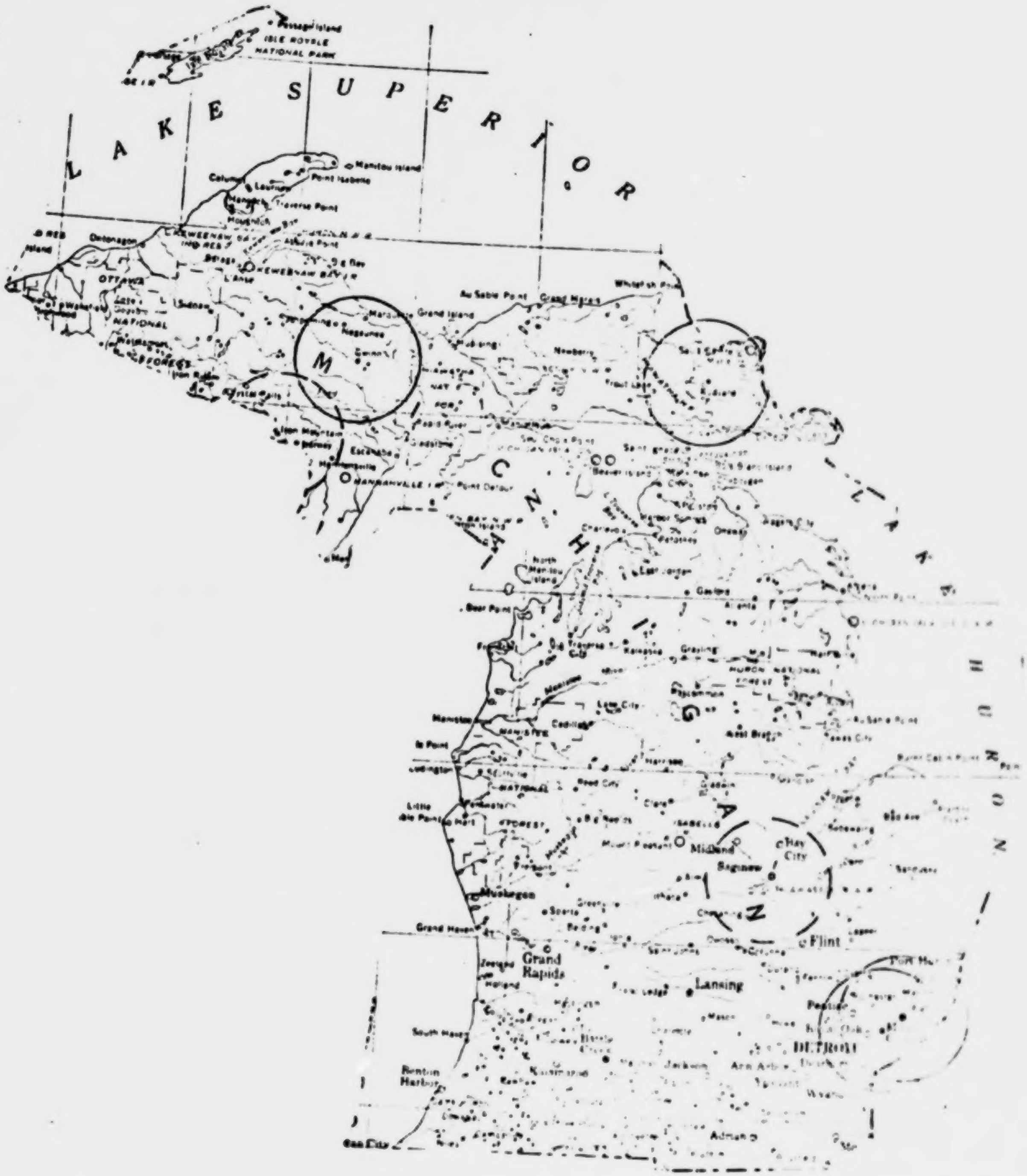
Newburyport
North Adams
Athol
Fitchburg
Lowell
Lawrence
Gloucester
Greenfield
Leominster
Pittsfield
Lynn
Beverly
Salem
MASSACHUSETTS
Somerville
Northampton
Amherst
Cambridge
Boston
Holyoke
Chicopee
Worcester
Quincy
Westfield
Springfield
Milford
Brockton
Provincetown
Attleboro
Plymouth
Taunton
CAPE COD
Fall River
Barnstable
New Bedford
Hyannis
Falmouth
Monomoy Point
Edgartown
Martha's Vineyard
Nantucket
Nantucket Island

Michigan

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
A Detroit SMSA/ Detroit Tank Plant	Army	3@ 60 ea.	winter: 200 summer: 30	spreader stoker	1941	80	50	3.8	17.7	3584	have 2 gas fired boilers @ 60,000 lb/hr ea.; boilers are in need of repair
Chippewa Count/ Kincheloe AFB	Air Force	4@45 ea.	winter: 80 summer: 20	traveling grate stoker	2-1952 1959 1960	98	50	25.7	1.0	72.6	refuse from county
Marquette County/ K.I. Sawyer AFB	AirForce	2@ 30 ea.	high:63.5 low: 13.6	spreader stoker	1960	24	50	25	0.8		3 boilers were converted to #6 oil in 1973; refuse supply is from Air Force Hdq.-base indicates a supply of 45 tpd.
Detroit SMSA/ Selfridge ANGB	AirForce	2@ 16 ea. 6@ 45 ea. 4@ 42 ea. 4@ 34 ea.									
B Dickenson County/Iron Mt. VA Hosp.	VA	3@ 18.3 ea.			1948						gas; bunkers only remaining equipment for coal
C Iasco County/ Wurtsmith AFB	AirForce	2@ 25 ea. 2@ 31.2ea.									#6 fuel oil
Ann Arbor SMSA/VA Hosp.	VA	3@ 19.5ea.									gas and #2 fuel oil

Michigan

SMSA-County/ Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
Calhoun County VA Hosp.	VA	4@ 22.4ea. 1@ 18.2									gas and #2 oil
Saginaw SMSA/ VA Hosp	VA	3@ 13.3ea.									gas and #2 oil
Calhoun County/ Federal Center	GSA	4@ 16.2ea.	40	spreader stoker	1921						coal fired boilers not used-replaced by gas fired boilers


Passage Island
ISLE ROYALE
NATIONAL PARK
LAKE SUPERIOR
Manitou Island
Point Isabelle
Calumet
Laurium
Hancock
Traverse Point
Houghton
Ontonagon
KEWEENAW BAY
L'Anse
OTTAWA
NATIONAL
FOREST
Iron River
Marquette
Grand Island
Negaunee
M
Au Sable Point
Grand Marais
Whitefish Point
Newberry
Escanaba
Point Detour
Beaver Island
North Manitou Island
Charlevoix
Harbor Springs
Petoskey
Onaway
East Jordan
Gaylord
Traverse City
Kalkaska
Grayling
HURON NATIONAL FOREST
Lake City
Cadillac
Manistee
Ludington
West Branch
Tawas City
Au Sable Point
Reed City
Big Rapids
Clare
Mount Pleasant
Midland
Bay City
Saginaw
N
Muskegon
Grand Haven
Grand Rapids
Holland
Flint
Lansing
Port Huron
Pontiac
DETROIT
South Haven
Kalamazoo
Jackson
Ann Arbor
Benton Harbor
Adrian
L A K E M I C H I G A N
L A K E H U R O N

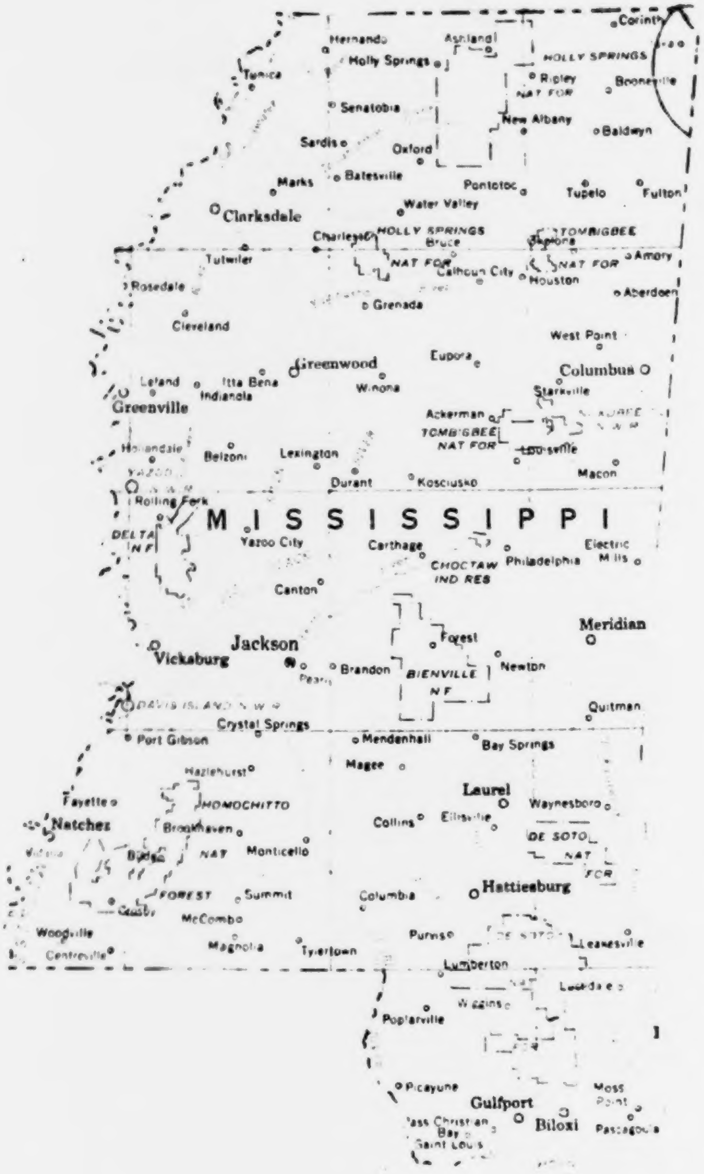
Minnesota

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
B	Minneapolis-St. Paul SMSA/Twin Cities AAP	Army	3 @ 85 ea 4 @ 100 ea	avg: 105								gas
C	Minneapolis-St. Paul SMSA/Minneapolis VA Hospital	VA	4 @ 18.5 ea 1 @ 17.25									1 on gas; 5 on #5 fuel oil
	Stearns County/St. Cloud VA Hospital	VA	2 @ 21 ea. 2 @ 18 ea.									gas and #2 oil

MINNESOTA
Warroad
Roseau
Hallock
Greenbush
Baudette
Rainy River
International Falls
Stephen
Warren
Thief River Falls
RED LAKE IND RES
Big Falls
NETT LAKE IND RES
SUPERIOR
NATIONAL
FOREST
GRAND PORTAGE NAT MON
Grand Portage
Grand Marais
East Grand Forks
Red Lake Falls
Crookston
NETT LAKE I R
Blackduck
CHIPPEWA NAT FOR
Tower
Ely
Babbitt
SUPERIOR N F
Buhl
Virginia
Gilbert
Chisholm
Hibbing
Eveleth
Keewatin
Nashwauk
Coleraine
Grand Rapids
Silver Bay
Fosston
Bagley
Bemidji
Cass Lake
Ada
WHITE EARTH IND RES
Mahnomen
LEECH LAKE IND RES
Walker
CHIPPEWA N F
Two Harbors
Moorhead
Park Rapids
Hill City
Alborn
Detroit Lakes
FOND DU LAC IND RES
Proctor
Duluth
Cloquet
Barnesville
Perham
Pelican Rapids
Wadena
Aitkin
Crosby
Moose Lake
Staples
Brainerd
Fergus Falls
Breckenridge
MILLE LAC I R
Sandstone
Elbow Lake
Long Prairie
Little Falls
Alexandria
Mora
Wheaton
Sauk Centre
Melrose
Milaca
Morris
Glenwood
Sauk Rapids
St Cloud
Princeton
Cambridge
Benson
Paynesville
Ortonville
Appleton
Buffalo
Anoka
White Bear
Willmar
Litchfield
Minneapolis
St Paul
St Louis Park
Madison
Montevideo
Dawson
Granite Falls
Hutchinson
Bloomington
Chaska
Canby
Olivia
Glencoe
Hastings
PRAIRIE ISLAND
Red Wing
UPPER SIOUX I R
Shakopee
New Prague
LOWER SIOUX I R
Redwood Falls
Marshall
Gaylord
Montgomery
Cannon Falls
Le Sueur
Lake City
Northfield
Wabasha
Sleepy Eye
St Peter
Faribault
Tyler
Springfield
Mankato
Owatonna
Rochester
Winona
PIPESTONE NAT MON
Austin

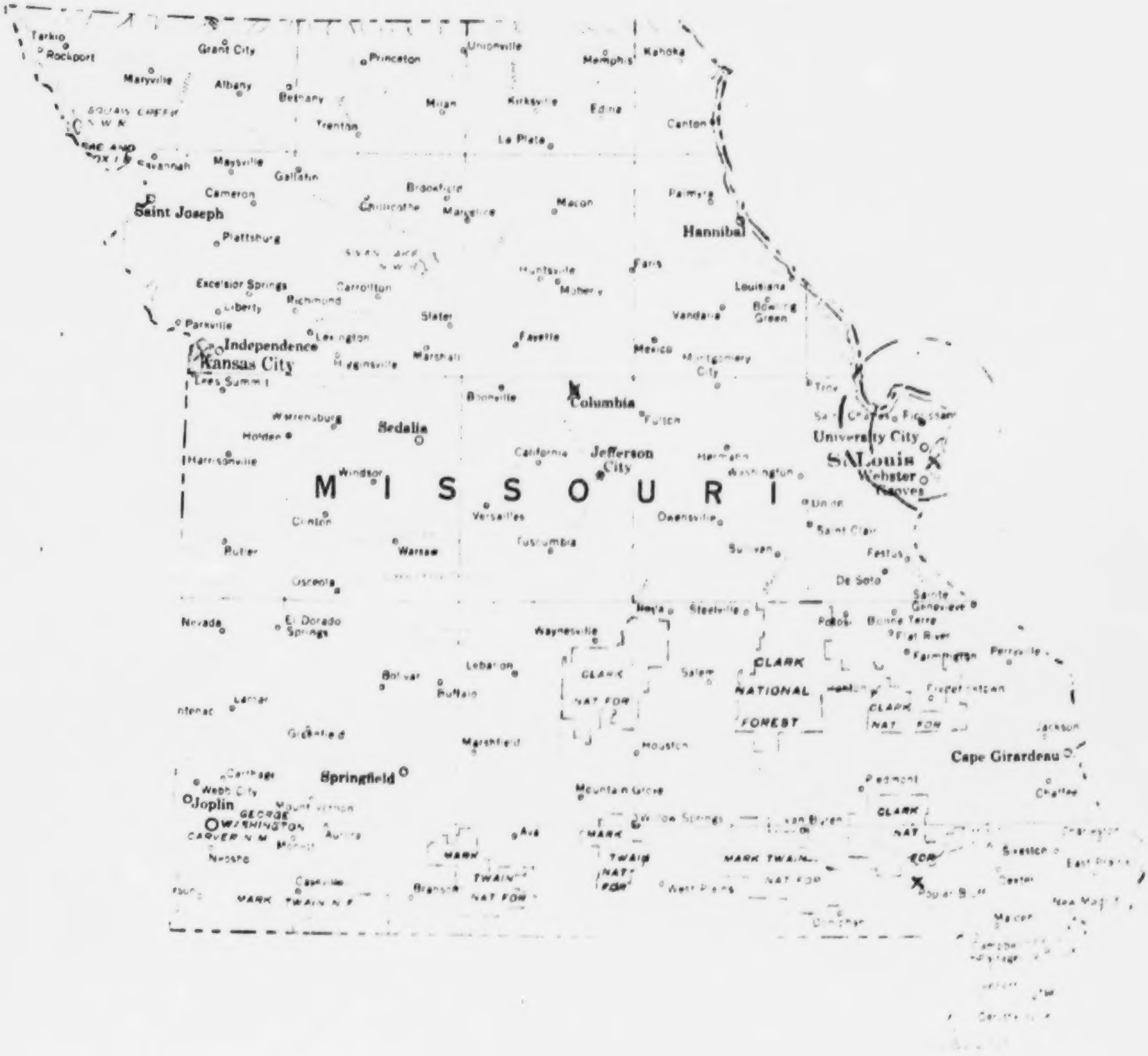
Mississippi

	SMSA-County/ Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
C	Harrison County/ Gulfport VA Hospital	VA	18.4 14.2 8.5									gas and #2 oil
	Jackson SMSA/ Jackson VA Hospital	VA	27.5 17.5 10									gas and #2 oil
	Harrison County/ Keesler AFB	Air Force	3 @ 33.4 ea.									natural gas


MISSISSIPPI
Hernando
Ashland
Corinth
Holly Springs
HOLLY SPRINGS
Tunica
Ripley
NAT FOR
Booneville
Senatobia
New Albany
Baldwyn
Sardis
Oxford
Marks
Batesville
Pontotoc
Tupelo
Fulton
Clarksdale
Water Valley
Charleston
HOLLY SPRINGS
Bruce
NAT FOR
TOMBIGBEE
NAT FOR
Amory
Tutwiler
Calhoun City
Houston
Rosedale
Aberdeen
Grenada
Cleveland
West Point
Greenwood
Eupora
Columbus
Leland
Itta Bena
Indianola
Winona
Starkville
Greenville
Ackerman
TOMBIGBEE
NAT FOR
Louisville
Hollandale
Belzoni
Lexington
YAZOO
N W R
Macon
Durant
Kosciusko
Rolling Fork
DELTA
N F
Yazoo City
Carthage
Philadelphia
Electric Mills
CHOCTAW
IND RES
Canton
Meridian
Jackson
Forest
Vicksburg
Pearl
Brandon
BIENVILLE
N F
Newton
DAVIS ISLAND N W R
Quitman
Crystal Springs
Port Gibson
Mendenhall
Bay Springs
Hazlehurst
Magee
Laurel
Fayette
HOMOCHITTO
Waynesboro
Natchez
Brookhaven
Collins
Ellisville
DE SOTO
NAT
FOR
NAT
Monticello
FOREST
Summit
Columbia
Hattiesburg
Gloster
McComb
Purvis
DE SOTO
Leakesville
Woodville
Centreville
Magnolia
Tylertown
Lumberton
Lucedale
Wiggins
Poplarville
Picayune
Moss Point
Gulfport
Pass Christian
Bay Saint Louis
Biloxi
Pascagoula

Missouri

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
St.Louis SMSA/ Jefferson Barracks Hosp.	VA	3@ 33 ea.	winter: 35 avg: 28								gas
Johnson County/ Whiteman AFB	Air Force	3@ 35 ea.									gas; boilers were designed to accomodate spreader stokers
Kansas City SMSA/Richards-Gebaur AFB	Air Force	4@ 138.5 total									natural gas and fuel oil
Lake City AAP	Army	3@ 25ea.									gas
Pulaski County /Fort Leonard Wood	Army	1@ 10 3@ 20 ea. 2@ 18 ea. 3@ 27 ea. 2@ 46 ea.									oil; 46,000#/hr boilers are package boilers
Boone County/ Columbia VA Hospital	VA	2760 total									gas and #2 oil
Kansas City SMSA/VA Hosp.	VA	3@ 19 5 ea									gas and #2 oil
Butler County /Poplar Bluff VA Hospital	VA	3@ 12 3 ea									gas and #2 oil
St.Louis SMSA/ St.Louis VA Hospital	VA	3@ 18 8 ea									gas and #6 oil


MISSOURI
Tarkio
Rockport
Grant City
Princeton
Unionville
Memphis
Kahoka
Maryville
Albany
Bethany
Milan
Kirksville
Edina
Trenton
Canton
La Plata
Savannah
Maysville
Gallatin
Cameron
Brookfield
Chillicothe
Marceline
Macon
Palmyra
Saint Joseph
Hannibal
Plattsburg
Huntsville
Paris
Moberly
Louisiana
Excelsior Springs
Carrollton
Liberty
Richmond
Vandalia
Bowling Green
Parkville
Slater
Independence
Lexington
Fayette
Mexico
Kansas City
Higginsville
Marshall
Montgomery City
Lees Summit
Boonville
Columbia
Troy
Fulton
Warrensburg
Sedalia
Holden
University City
California
Jefferson City
Hermann
St. Louis
Harrisonville
Windsor
Washington
Webster
Kirkwood
Versailles
Union
Clinton
Owensville
Saint Clair
Butler
Warsaw
Tuscumbia
Sullivan
Festus
Osceola
De Soto
Sainte Genevieve
Steelville
Nevada
El Dorado Springs
Waynesville
Potosi
Bonne Terre
Flat River
Farmington
Perryville
Lebanon
Salem
CLARK NATIONAL FOREST
CLARK NAT. FOR.
Bolivar
Buffalo
Fredericktown
Lamar
Greenfield
Marshfield
Houston
Jackson
Cape Girardeau
Carthage
Springfield
Piedmont
Webb City
Joplin
Mount Vernon
Mountain Grove
Chaffee
GEORGE WASHINGTON CARVER N.M.
Aurora
Monett
Ava
Willow Springs
Van Buren
Charleston
Sikeston
Neosho
MARK TWAIN NAT. FOR.
East Prairie
Cassville
Branson
West Plains
Poplar Bluff
Dexter
New Madrid
MARK TWAIN N.F.
Doniphan
Malden
Caruthersville

Montana

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
B	Great Falls SMSA/ Malmstrom AFB	Air Force	3 @ 13.4 ea.	winter: 12.4		1940 (convert.- 1960)						gas; limited space
C	Fort Harrison VA/Hospital	VA	10 2 @ 12 ea.									gas and #2 oil
	Custer County/ Miles City VA Hospital	VA	3 @ 10.8ea.									#2 oil

Montana

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
B	Great Falls SMSA/ Malmstrom AFB	Air Force	3 @ 13.4 ea.	winter: 12.4		1940 (convert.-1960)						gas; limited space
C	Fort Harrison VA/Hospital	VA	10 2 @ 12 ea.									gas and #2 oil
	Custer County/ Miles City VA Hospital	VA	3 @ 10.8ea.									#2 oil

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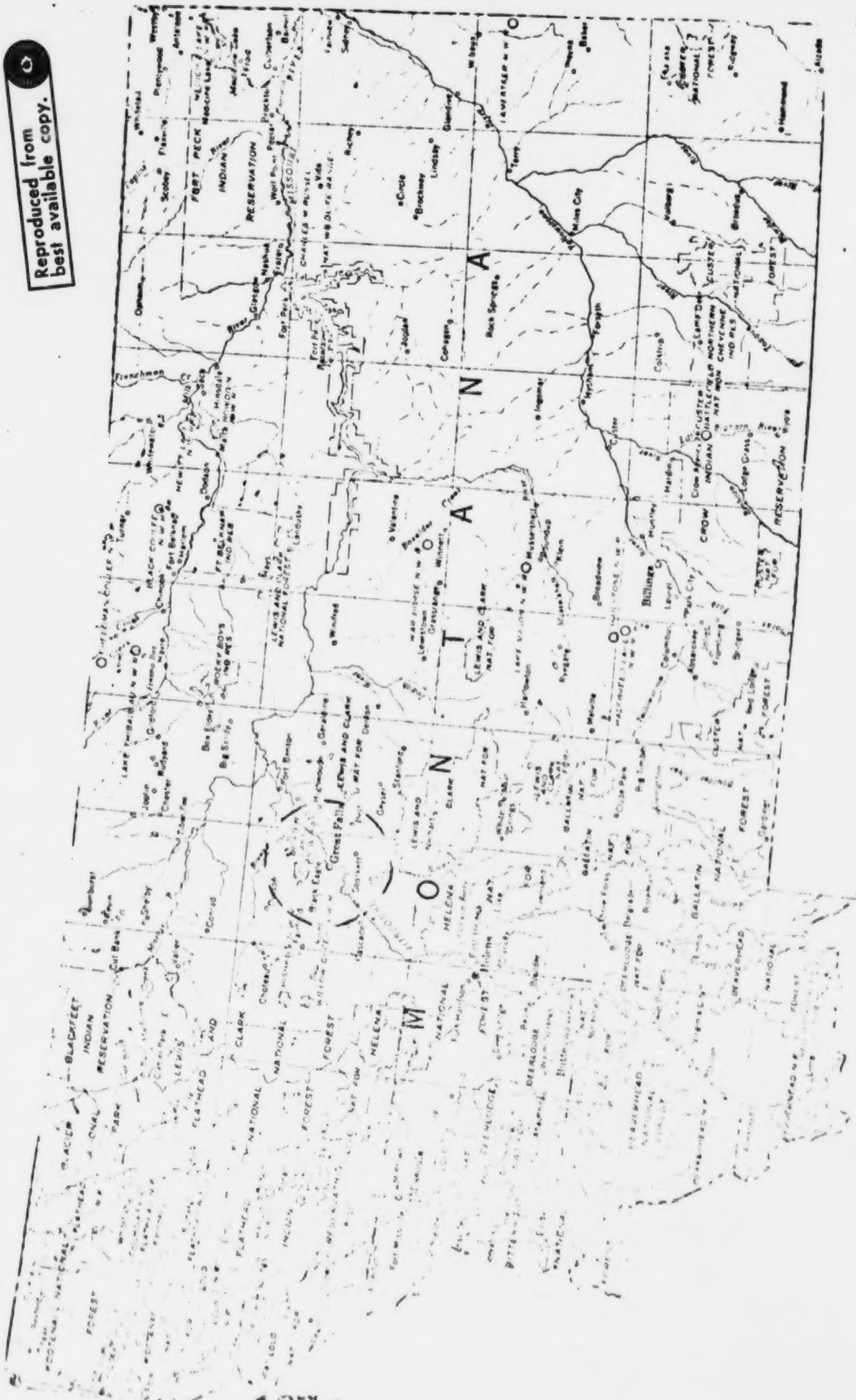
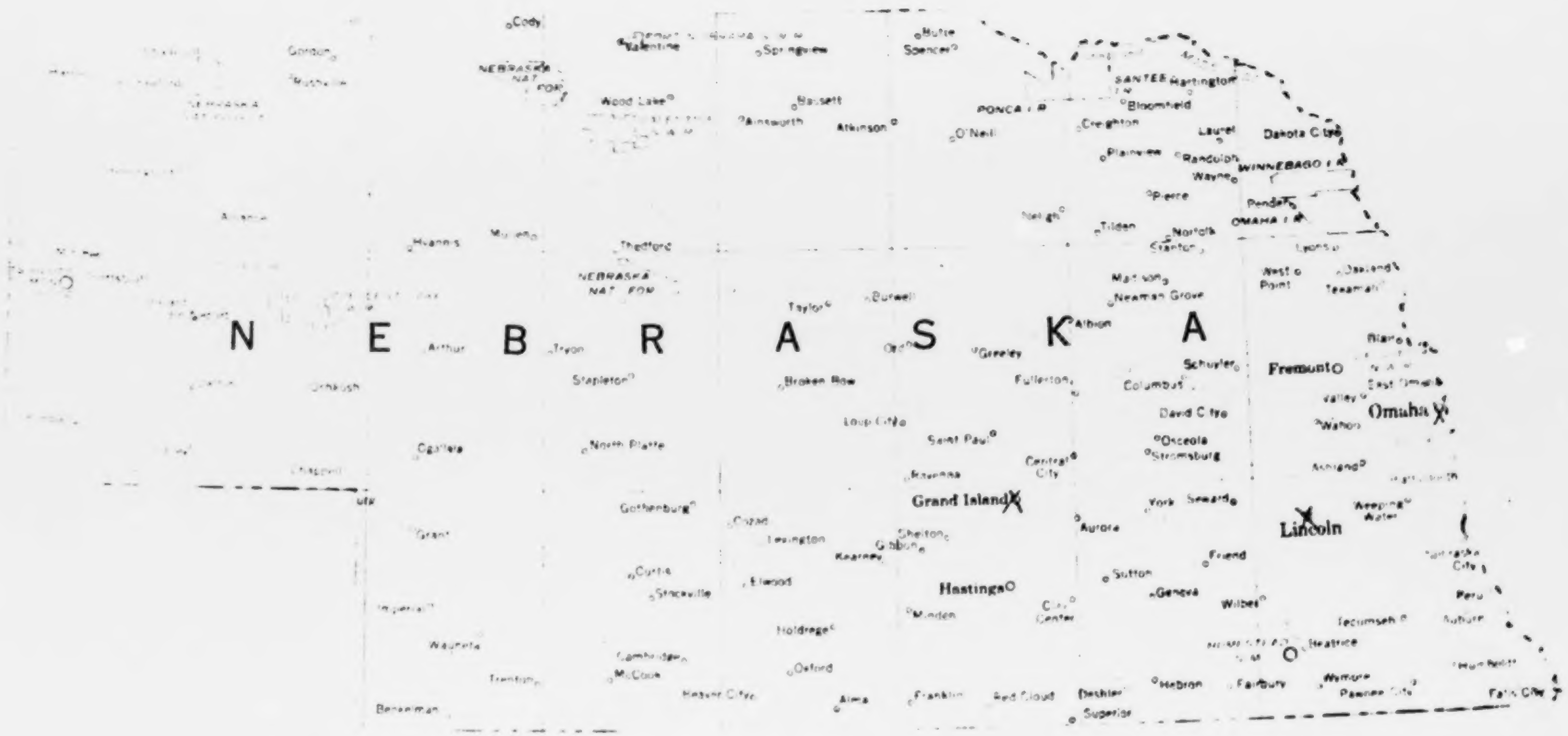

M O N T A N A
Great Falls
HELENA
Billings
BLACKFEET INDIAN RESERVATION
GLACIER NATIONAL PARK
FORT PECK INDIAN RESERVATION
CROW INDIAN RESERVATION
NORTHERN CHEYENNE INDIAN RES.
CUSTER NATIONAL FOREST
LEWIS AND CLARK NATIONAL FOREST
GALLATIN NATIONAL FOREST
HELENA NATIONAL FOREST
FLATHEAD NATIONAL FOREST
KOOTENAI NATIONAL FOREST
Frenchman
Miles City
Glasgow
Lewistown
Havre

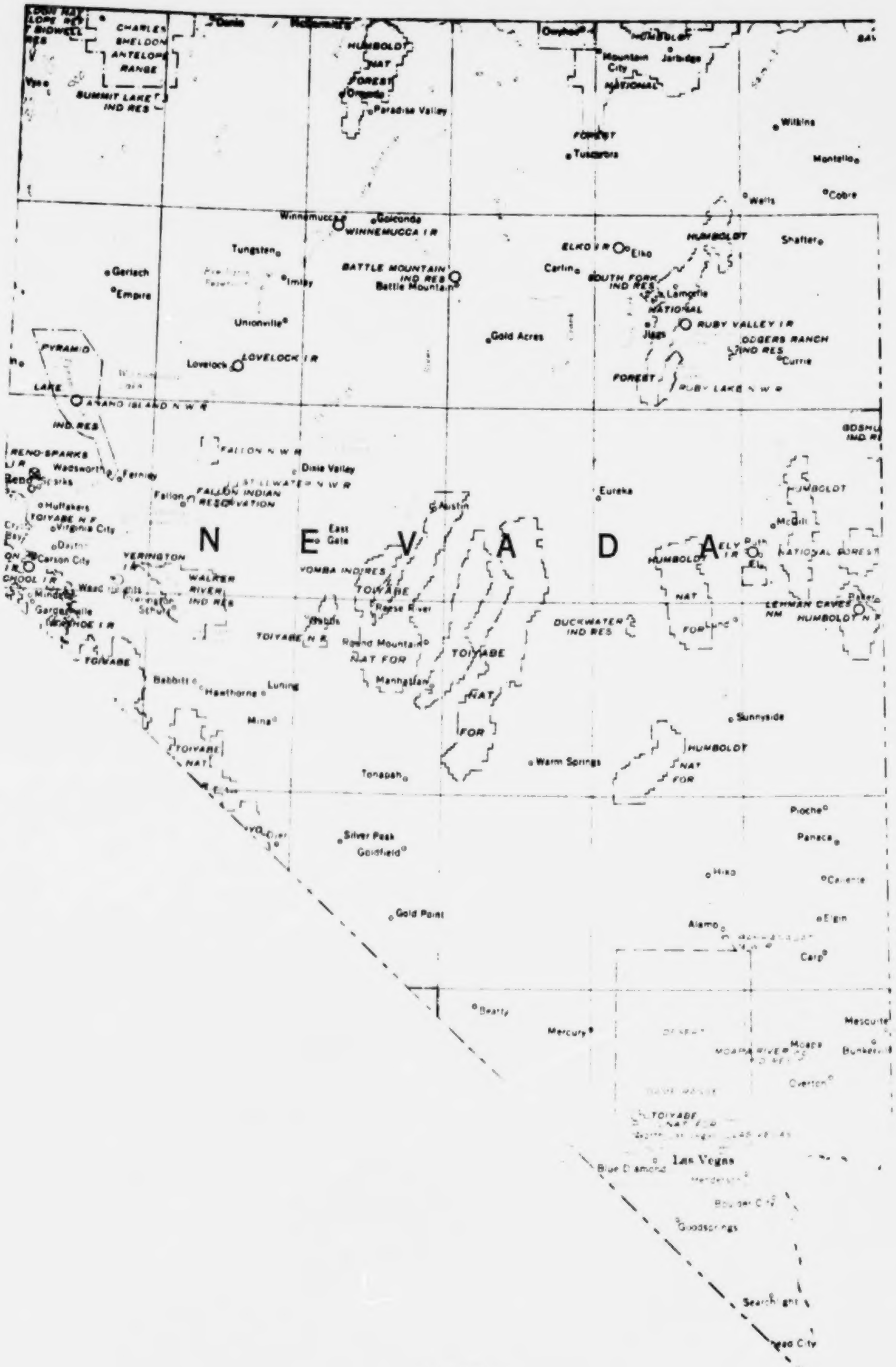
Nebraska

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
Hall County/ Grand Island VA Hosp.	VA	3@ 11.3 ea.									gas and #2 oil
Lincoln SMSA/ Lincoln VA Hosp.	VA	3@ 8.625ea									gas and #2 oil
Omaha SMSA/ Omaha VA Hosp.	VA	3@ 12.8ea.									gas and #5 oil


NEBRASKA
Cody
Gordon
Rushville
Valentine
Springview
Butte
Spencer
NEBRASKA NAT. FOR.
Wood Lake
Bassett
Ainsworth
Atkinson
O'Neill
PONCA I.R.
SANTEE I.R.
Hartington
Bloomfield
Creighton
Laurel
Dakota City
Plainview
Randolph
Wayne
WINNEBAGO I.R.
Pierce
Pender
OMAHA I.R.
Neligh
Tilden
Norfolk
Stanton
Lyons
Hyannis
Mullen
Thedford
NEBRASKA NAT. FOR.
West Point
Oakland
Tekamah
Madison
Newman Grove
Taylor
Burwell
Albion
Arthur
Tryon
Ord
Greeley
Blair
Schuyler
Fremont
Stapleton
Broken Bow
Fullerton
Columbus
East Omaha
Valley
Omaha
Oshkosh
Wahoo
David City
Loup City
Saint Paul
Osceola
Stromsburg
Ogallala
North Platte
Central City
Ashland
Chappell
Ravenna
Grand Island
York
Seward
Plattsmouth
Gothenburg
Cozad
Lexington
Shelton
Gibbon
Aurora
Weeping Water
Lincoln
Grant
Kearney
Nebraska City
Curtis
Stockville
Elwood
Hastings
Sutton
Friend
Geneva
Wilber
Peru
Imperial
Clay Center
Minden
Tecumseh
Auburn
Holdrege
Wauneta
Cambridge
Beatrice
McCook
Oxford
Hebron
Fairbury
Wymore
Humboldt
Trenton
Beaver City
Alma
Franklin
Red Cloud
Deshler
Pawnee City
Falls City
Benkelman
Superior

Nevada

SMSA-County/ Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Refuse Supply (tpd) Other Fed.	Refuse Supply (tpd) Com.	Notes
Mineral County/ NAD, Hawthorne, Nev.	Navy	1@ 20									#6 oil
Reno SMSA/ Reno VA Hosp.	VA	3@ 5.2 ea.									#6 oil


NEVADA
CHARLES SHELDON ANTELOPE RANGE
SUMMIT LAKE IND RES
Denio
McDermitt
HUMBOLDT NAT FOREST
Orovada
Paradise Valley
Owyhee
HUMBOLDT
Mountain City
Jarbidge
NATIONAL
FOREST
Tuscarora
Wilkins
Montello
Wells
Cobre
Winnemucca
Golconda
WINNEMUCCA I R
Tungsten
Gerlach
Empire
Imlay
BATTLE MOUNTAIN IND RES
Battle Mountain
ELKO I R
Elko
Carlin
SOUTH FORK IND RES
Lamoille
HUMBOLDT
Shafter
NATIONAL
RUBY VALLEY I R
Jiggs
ODGERS RANCH IND RES
Currie
Unionville
Gold Acres
PYRAMID
LAKE
Lovelock
LOVELOCK I R
FOREST
RUBY LAKE N W R
ANAHO ISLAND N W R
IND RES
GOSHUTE IND RES
RENO-SPARKS I R
Reno
Sparks
Wadsworth
Fernley
FALLON N W R
Dixie Valley
STILLWATER N W R
Fallon
FALLON INDIAN RESERVATION
Eureka
Austin
HUMBOLDT
Huffakers
TOIYABE N F
Virginia City
Dayton
Carson City
East Gate
McGill
YERINGTON I R
WALKER RIVER IND RES
YOMBA IND RES
TOIYABE
Reese River
ELY I R
Ely
Ruth
NATIONAL FOREST
HUMBOLDT
NAT
FOR
LEHMAN CAVES NM
HUMBOLDT N F
Baker
Minden
Gardnerville
WASHOE I R
Yerington
Schurz
Gabbs
TOIYABE N F
Round Mountain
NAT FOR
TOIYABE
NAT
FOR
DUCKWATER IND RES
Lund
TOIYABE
Babbitt
Hawthorne
Luning
Manhattan
Mina
Sunnyside
TOIYABE NAT
Warm Springs
HUMBOLDT NAT FOR
Tonopah
Pioche
Panaca
Silver Peak
Goldfield
Hiko
Caliente
Gold Point
Elgin
Alamo
Carp
Beatty
Mercury
Mesquite
Bunkerville
MOAPA RIVER IND RES
Moapa
Overton
TOIYABE NAT FOR
Las Vegas
Blue Diamond
Henderson
Boulder City
Goodsprings
Searchlight
Nelson
Dead City

New Hampshire

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Refuse Supply (tpd) Other Fed.	Refuse Supply (tpd) Com.	Notes
C Rockingham County Pease AFB	AirForce	2@ 110									gas
Manchester SMSA/Manchestr VA Hosp.	VA	3@ 10 ea.									#6 oil

NEW HAMPSHIRE
Groveton
Berlin
Lancaster
Whitefield
Littleton
WHITE
Woodsville
Lincoln
MTN
NAT FOREST
Conway
Plymouth
Hanover
Lebanon
Wolfeboro
Franklin
Laconia
Newport
Claremont
Farmington
Rochester
Concord
Dover
Durham
Manchester
Keene
Exeter
Peterborough
Haverhill
Nashua

New Jersey

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
B	Philadelphia SMSA/Fort Dix	Army	2@ 34 ea. 2@ 40 ea. 8@ 50 ea.									only 3 of 8,50,000#/hr boilers were once coal; all are now oil
C	N.Y.-Northern N.J SMSA/ Bayonne MOT	Army	3@ 60 ea. 1@ 81									oil; 81,000 #/hr boilers is package type
	Monmouth County /Fort Monmouth	Army	2@ 20 ea. 2@ 29 ea. 4@ 39 ea.									oil
	N.Y.-Northern N.J. SMSA/ Picatinny Arsenal	Army	2@ 10 ea. 1@ 45									oil; 45,000 #/hr boiler is package type
	Philadelphia SMSA/McGuire AFB	Air Force	2@ 31 ea. 4@ 50 ea.									natural gas
	Ocean County/ Lakehurst NAS	Navy	3@ 35 ea. 1@ 45									#6 oil
	N.Y.-Northern N.J. SMSA/ Naval AIP Propulsion Test Lab	Navy	3@ 40 ea.									#6 oil
	N.Y.-Northern N.J. SMSA/East Orange VA Hospital	VA	4@ 26 ea.									#6 oil

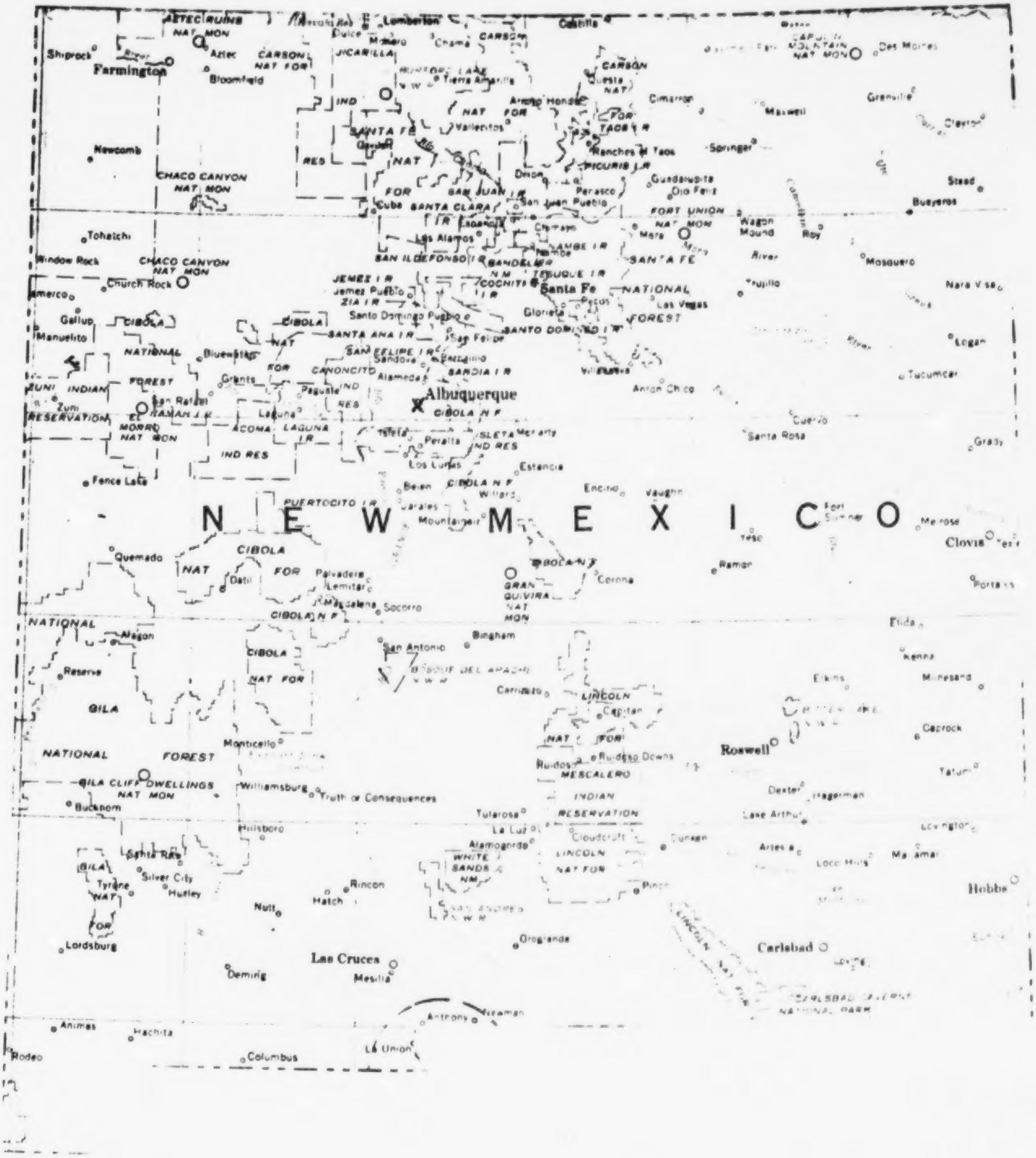
New Jersey

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
N.Y.-Northern N.J. SMSA/ Lyons VA Hospital	VA	15 18 2@ 26 ea.									gas and #2 oil
C N.Y.-Northern N.J. SMSA/ Gamerville VA Hospital	VA	3@ 9 ea.									#6 oil

Newton
Paterson
Newark
Elizabeth
New Brunswick
Perth Amboy
Sandy Hook
Princeton
Red Bank
Long Branch
Freehold
Asbury Park
Trenton
NEW JERSEY
Mount Holly
Camden
Toms River
Gloucester City
Woodbury
Barnegat
Wilmington
Hammonton
Salem
Vineland
Bridgeton
Millville
Pleasantville
Atlantic City
Ocean City
Wildwood
Cape May

New Mexico

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
Albuquerque SMSA/ Kirtland AFB	Air Force	4@ 30 ea			1952						gas, no APC
Albuquerque SMSA/ VA Hospital	VA	12 ea 12.1 12.6									gas #2 oil


NEW MEXICO
Aztec Ruins Nat Mon
Shiprock
Farmington
Aztec
Bloomfield
Carson Nat For
Dulce
Lumberton
Chama
Carson
Costilla
Capulin Mountain Nat Mon
Des Moines
Jicarilla Ind Res
Tierra Amarilla
Carson Nat For
Questa
Cimarron
Maxwell
Grenville
Clayton
Newcomb
Vallecitos
Taos I R
Ranchos de Taos
Springer
Chaco Canyon Nat Mon
Santa Fe Nat For
Gavilan
Picuris I R
Guadalupita
Ojo Feliz
Dixon
Penasco
San Juan I R
San Juan Pueblo
Fort Union Nat Mon
Wagon Mound
Roy
Bueyeros
Cuba
Santa Clara I R
Espanola
Mora
Tohatchi
Los Alamos
San Ildefonso I R
Bandelier N M
Nambe I R
Tesuque I R
Santa Fe National Forest
Mosquero
Window Rock
Chaco Canyon Nat Mon
Church Rock
Jemez I R
Jemez Pueblo
Zia I R
Cochiti
Santa Fe
Pecos
Las Vegas
Trujillo
Nara Visa
Gallup
Manuelito
Cibola National Forest
Santo Domingo Pueblo
Glorieta
Santo Domingo I R
Santa Ana I R
San Felipe
Logan
Bluewater
Grants
San Felipe I R
Sandoval
Bernalillo
Sandia I R
Villanueva
Canoncito Ind Res
Alameda
Paguate
Tucumcari
Zuni Indian Reservation
Zuni
San Rafael
Ramah I R
El Morro Nat Mon
Laguna
Acoma Ind Res
Laguna I R
Albuquerque
Cibola N F
Anton Chico
Cuervo
Isleta
Peralta
Isleta Ind Res
Moriarty
Santa Rosa
Grady
Los Lunas
Estancia
Fence Lake
Belen
Cibola N F
Willard
Encino
Vaughn
Puertocito I R
Jarales
Mountainair
Fort Sumner
Melrose
Yeso
Clovis
Quemado
Cibola Nat For
Datil
Polvadera
Lemitar
Magdalena
Socorro
Gran Quivira Nat Mon
Cibola N F
Corona
Ramon
Portales
Cibola N F
National
Apache
Elida
San Antonio
Bingham
Kenna
Reserve
Cibola Nat For
Bosque del Apache N W R
Carrizozo
Elkins
Milnesand
Gila
Lincoln
Capitan
Caprock
National Forest
Monticello
Lincoln Nat For
Ruidoso
Ruidoso Downs
Roswell
Gila Cliff Dwellings Nat Mon
Mescalero Indian Reservation
Tatum
Williamsburg
Truth or Consequences
Buckhorn
Dexter
Hagerman
Tularosa
La Luz
Cloudcroft
Lake Arthur
Hillsboro
Alamogordo
Lincoln Nat For
Dunken
Lovington
Santa Rita
White Sands N M
Artesia
Loco Hills
Maljamar
Gila Nat For
Tyrone
Silver City
Hurley
Rincon
Hatch
Pinon
Hobbs
Nutt
San Andres N W R
Lordsburg
Orogrande
Carlsbad
Las Cruces
Deming
Mesilla
Loving
Carlsbad Caverns National Park
Anthony
Newman
Animas
Hachita
Rodeo
Columbus
La Union

New York

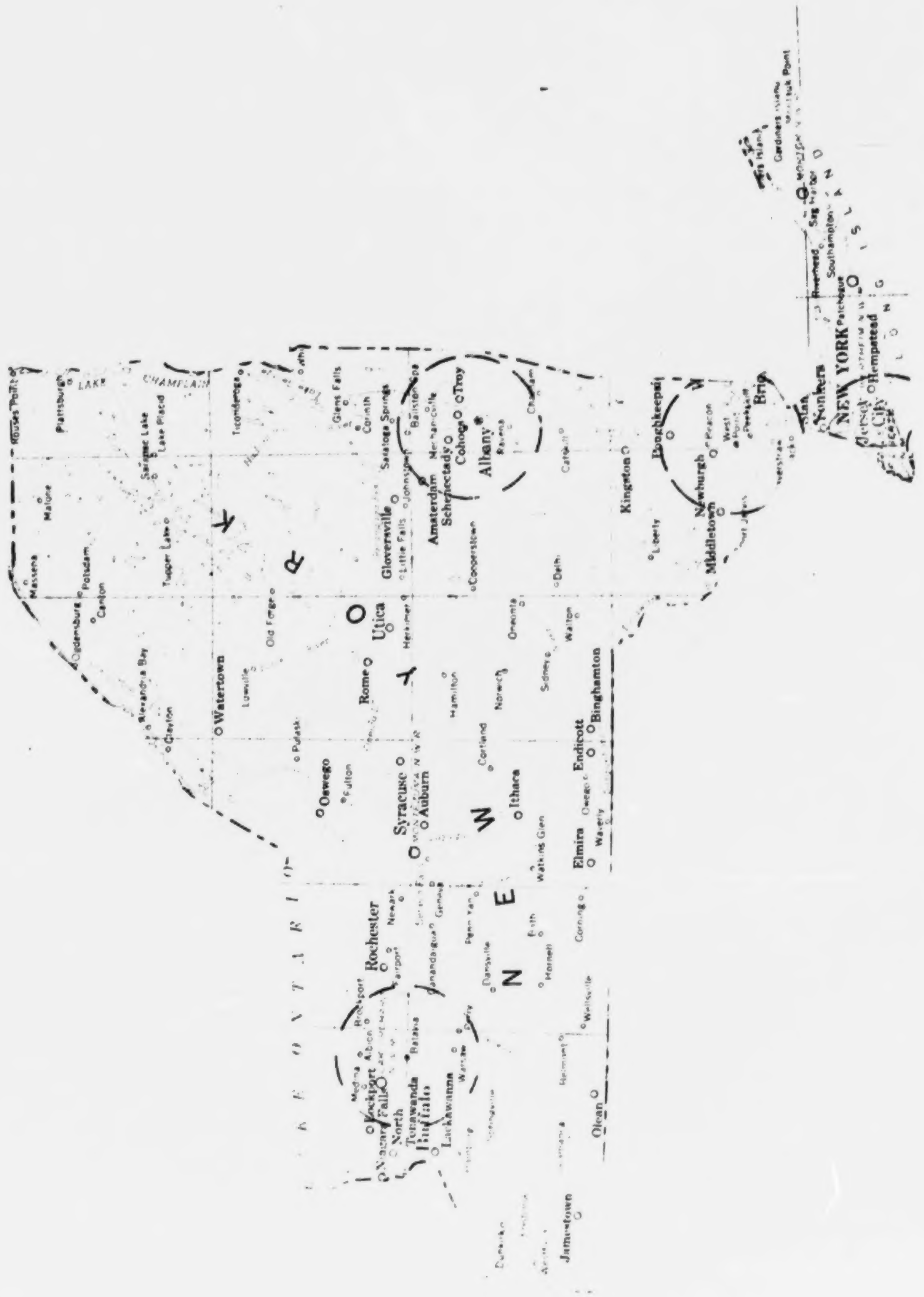
	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
B	Genesse County/ Batavia VA Hospital	VA	10			1966						gas; have an incinerator
	New York SMSA/ Montrose VA Hospital	VA	4 @ 25.3ea.									gas and #2 oil
	New York SMSA/ Castle Point VA Hospital	VA	1 @ 12 2 @ 20 ea			1950						oil
	New York SMSA/ Brooklyn MOT	Army	4 @ 15 ea.									oil; additionally - 2 oil (@ 28,000 #/hr ea) tube configuration prevents conversion
	Orange County/ US Military Academy	Army	186									oil; additionally - 4 oil (2 @ 206,000 #/hr ea and 2 @ 43,000 #/hr ea)
	Albany County/ Watervliet Arsenal	Army	2 @ 48 ea 2 @ 95 ea									oil; limited space
C	Utica-Rome SMSA/ Griffiss AFB	Air Force	4 @ 100 ea									oil

New York

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
Clinton County/ Plattsburgh AFB	Air Force	6 @ 50 ea									#6 oil
Albany-Schenectady-Troy SMSA/ Albany VA Hospital	VA	4 @ 25.3 ea									#6 oil
Steuben County/ Bath VA Hospital	VA	1 @ 30 2 @ 20 ea									gas and #2 oil
New York SMSA/ Bronx VA Hospital	VA	3 @ 35 ea 1 @ 30									gas and #2 oil
New York SMSA/ Brooklyn VA Hospital (Ft. Hamilton)	VA	4 @ 23.5 ea									#6 oil
Buffalo SMSA/ Buffalo VA Hospital	VA	4 @ 25.3 ea									#6 oil
New York SMSA/ Northport VA Hospital	VA	4 @ 40 ea 1 @ 21.1									#2 oil

New York

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
Clinton County/ Plattsburgh AFB	Air Force	6 @ 50 ea									#6 oil
Albany-Schenectady-Troy SMSA/ Albany VA Hospital	VA	4 @ 25.3 ea									#6 oil
Steuben County/ Bath VA Hospital	VA	1 @ 30 2 @ 20 ea									gas and #2 oil
New York SMSA/ Bronx VA Hospital	VA	3 @ 35 ea 1 @ 30									gas and #2 oil
New York SMSA/ Brooklyn VA Hospital (Ft. Hamilton)	VA	4 @ 23.5 ea									#6 oil
Buffalo SMSA/ Buffalo VA Hospital	VA	4 @ 25.3 ea									#6 oil
New York SMSA/ Northport VA Hospital	VA	4 @ 40 ea 1 @ 21.1									#2 oil

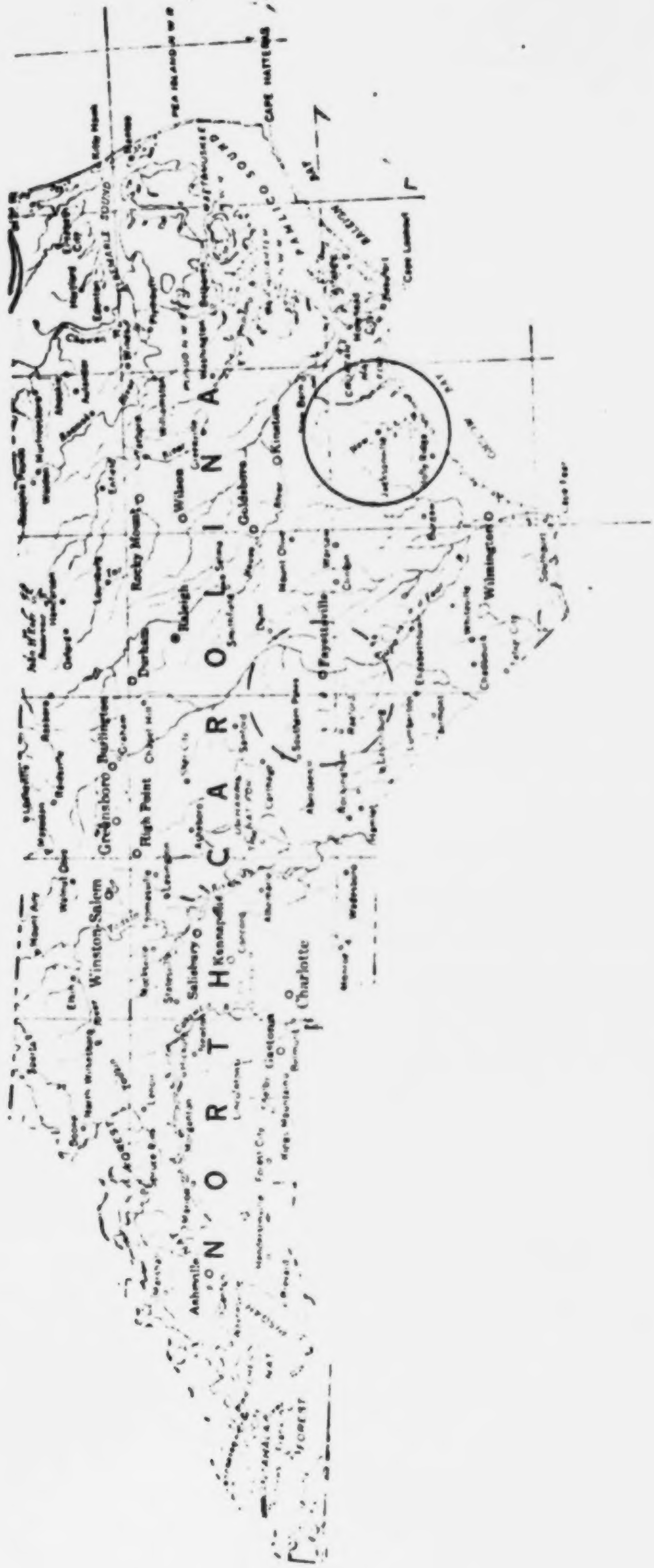

NEW YORK
LAKE ONTARIO
LAKE CHAMPLAIN
LONG ISLAND
Buffalo
Niagara Falls
North Tonawanda
Lackawanna
Lockport
Rochester
Syracuse
Auburn
Oswego
Watertown
Rome
Utica
Ithaca
Elmira
Endicott
Binghamton
Olean
Jamestown
Gloversville
Amsterdam
Schenectady
Cohoes
Troy
Albany
Kingston
Poughkeepsie
Newburgh
Middletown
Yonkers
New York
Jersey City
Hempstead
Ogdensburg
Plattsburg
Saratoga Springs
Glens Falls
Ticonderoga
Massena
Malone
Potsdam
Canton
Tupper Lake
Saranac Lake
Lake Placid
Alexandria Bay
Clayton
Lowville
Old Forge
Pulaski
Fulton
Herkimer
Little Falls
Johnstown
Cooperstown
Oneonta
Norwich
Hamilton
Cortland
Sidney
Walton
Delhi
Owego
Waverly
Watkins Glen
Corning
Bath
Hornell
Dansville
Wellsville
Canandaigua
Geneva
Newark
Fairport
Brockport
Albion
Medina
Batavia
Warsaw
Perry
Penn Yan
Catskill
Liberty
Beacon
West Point
Peekskill
Mechanicville
Ballston Spa
Corinth
Chatham
Rensselaer
Southampton
Patchogue
Riverhead
Sag Harbor
Gardiners Island
Montauk Point

North Carolina

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
A	Onslow County/ Camp Lejeune	Navy	4 @ 100 ea	max: 360	Stoker		177	50	175	3.1	50.4	
B	Fayetteville SMSA/Fort Braggs	Army	17 25 4 @ 26 ea 4 @ 38 ea 3 @ 95 ea									Gas - originally coal: 3 @ 95,000 #/hr ea; 1 @ 38,000 #/hr; 25,000 #/hr and 17,000 #/hr (inactive); package boilers - 3 @ 38,000 #/hr ea; 25,000 #/hr 17,000 #/hr
C	Craven County/ Cherry Point Marine Corp. Air Station	Navy	3 @ 35 ea 1 @ 45 ea 2 @ 50 ea									#6 oil
	Wayne County Seymour Johnson AFB	Air Force	2 @ 25 ea									#5 fuel oil
	Fayetteville SMSA/ Fayetteville VA Hospital	VA	2 @ 12 ea 1 @ 8.6									gas and #2 oil

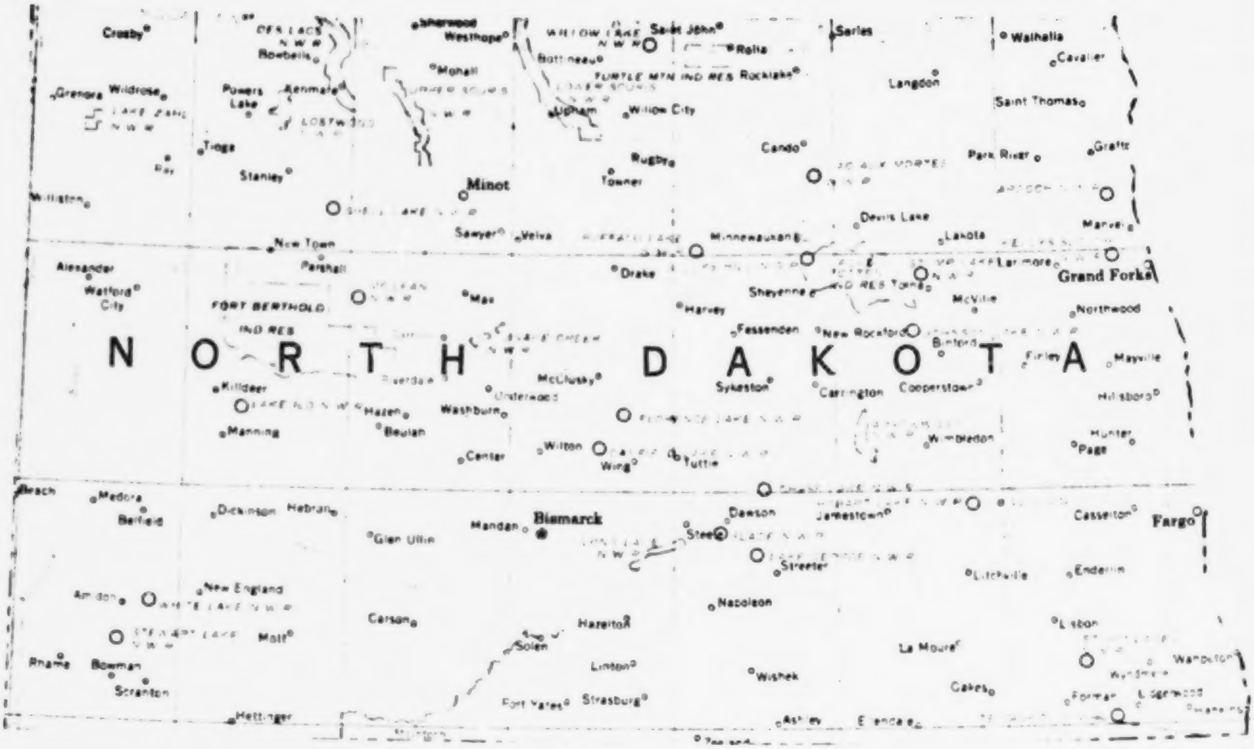
North Carolina

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
Oteen VA Hospital	VA	3 @ 17.5 ea									gas and #2 oil
Rowan County/ Salisbury VA Hospital	VA	3 @ 28.1 ea									gas and #2 oil


NORTH CAROLINA
Asheville
Gastonia
Charlotte
Kannapolis
Salisbury
Winston-Salem
High Point
Greensboro
Burlington
Durham
Raleigh
Rocky Mount
Wilson
Goldsboro
Kinston
Fayetteville
Wilmington
ALBEMARLE SOUND
PAMLICO SOUND
CAPE HATTERAS
Cape Lookout

North Dakota

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
C Ward County/ Minct AFB	AirForce	5@ 25 ea. 1@ 42									natural oil; one boiler could be converted to burn lignite
Grand Forks County/Grand Forks AFB	AirForce	2@ 25 ea. 2@ 45 ea.									#6 oil
Fargo-Moorhead SMSA/Fargo VA Hosp.	VA	4@ 6.5 ea.									gas & #2 oil


NORTH DAKOTA
Crosby
Des Lacs N.W.R.
Sherwood
Westhope
Willow Lake N.W.R.
Saint John
Rolla
Sarles
Walhalla
Cavalier
Bowbells
Mohall
Bottineau
Turtle Mtn Ind Res
Rocklake
Langdon
Grenora
Wildrose
Powers Lake
Kenmare
Lake Zahl N.W.R.
Lostwood N.W.R.
Upper Souris N.W.R.
Lower Souris N.W.R.
Upham
Willow City
Saint Thomas
Tioga
Ray
Stanley
Minot
Rugby
Towner
Cando
Park River
Grafton
Williston
Devils Lake
Lakota
Sawyer
Velva
Minnewaukan
New Town
Parshall
Alexander
Watford City
Fort Berthold Ind Res
Max
Drake
Harvey
Sheyenne
McVille
Larimore
Grand Forks
Northwood
Fessenden
New Rockford
Binford
Finley
Mayville
Killdeer
Riverdale
McClusky
Underwood
Sykeston
Carrington
Cooperstown
Hillsboro
Hazen
Beulah
Washburn
Manning
Wimbledon
Hunter
Page
Center
Wilton
Wing
Tuttle
Beach
Medora
Belfield
Dickinson
Hebron
Glen Ullin
Mandan
Bismarck
Dawson
Steele
Jamestown
Casselton
Fargo
Streeter
Litchville
Enderlin
Amidon
New England
White Lake N.W.R.
Carson
Hazelton
Napoleon
Lisbon
Stewart Lake N.W.R.
Mott
Solen
La Moure
Wahpeton
Rhame
Bowman
Linton
Wishek
Oakes
Scranton
Fort Yates
Strasburg
Forman
Lidgerwood
Hettinger
Ashley
Ellendale
Zeeland

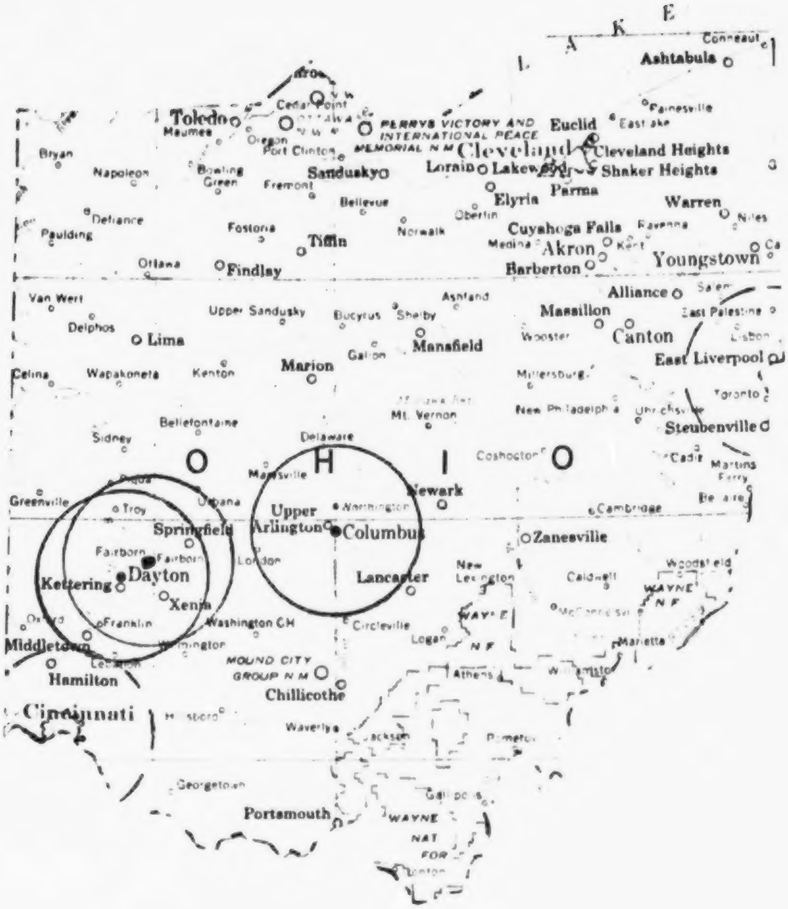
Oklahoma

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
C	Oklahoma SMSA/ Tinker AFB	Air Force	3 @ 20 ea. 4 @ 80 ea. 3 @ 100 ea.									gas
	/AF Plant #3 (ACFH)	Air Force	1 @ 80 2 @ 100 ea.									gas
	Muskogee County Muskogee VA Hospital	VA	3 @ 7 ea.ea.									gas and #2 oil
	Oklahoma City SMSA/Oklahoma City VA Hospital	VA	3 @ 19 ea.									gas and #2 oil
	VA Hospital/ Tuskegee	VA	2 @ 30.2 ea. 1 @ 24.2									gas and #6 oil

OKLAHOMA
Boise City
Texhoma
Guymon
Hooker
Beaver
Laverne
Buffalo
Shattuck
Arnett
Woodward
Alva
Waynoka
Cherokee
Fairview
Okeene
Medford
Blackwell
Newkirk
Ponca City
Enid
Perry
Stillwater
Pawnee
Fairfax
Cleveland
Pawhuska
Bartlesville
OSAGE INDIAN RESERVATION
Barnsdall
Hominy
Skiatook
Dewey
Nowata
Vinita
Miami
Picher
Afton
Jay
Collinsville
Claremore
Pryor
Tulsa
Sand Springs
Sapulpa
Bixby
Wagoner
Haskell
Tahlequah
Stilwell
Fort Gibson
Muskogee
Okmulgee
Bristow
Drumright
Cushing
Stroud
Chandler
Guthrie
Kingfisher
Edmond
Watonga
Thomas
Geary
El Reno
Oklahoma City
Midwest City
Norman
Tecumseh
Shawnee
Prague
Okemah
Henryetta
Wewoka
Seminole
Holdenville
Eufaula
Stigler
Sallisaw
Poteau
Wilburton
Hartshorne
McAlester
Ada
Konawa
Purcell
Pauls Valley
Wynnewood
Sulphur
Coalgate
Atoka
Tishomingo
Antlers
Durant
Hugo
Broken Bow
Idabel
Wright City
Madill
Ardmore
Marietta
Healdton
Wilson
Duncan
Marlow
Comanche
Waurika
Ryan
Temple
Walters
Lawton
Chickasha
Anadarko
Carnegie
Apache
Cordell
Clinton
Elk City
Sayre
Cheyenne
Erick
Hobart
Granite
Mangum
Snyder
Altus
Hollis
Frederick
Grandfield

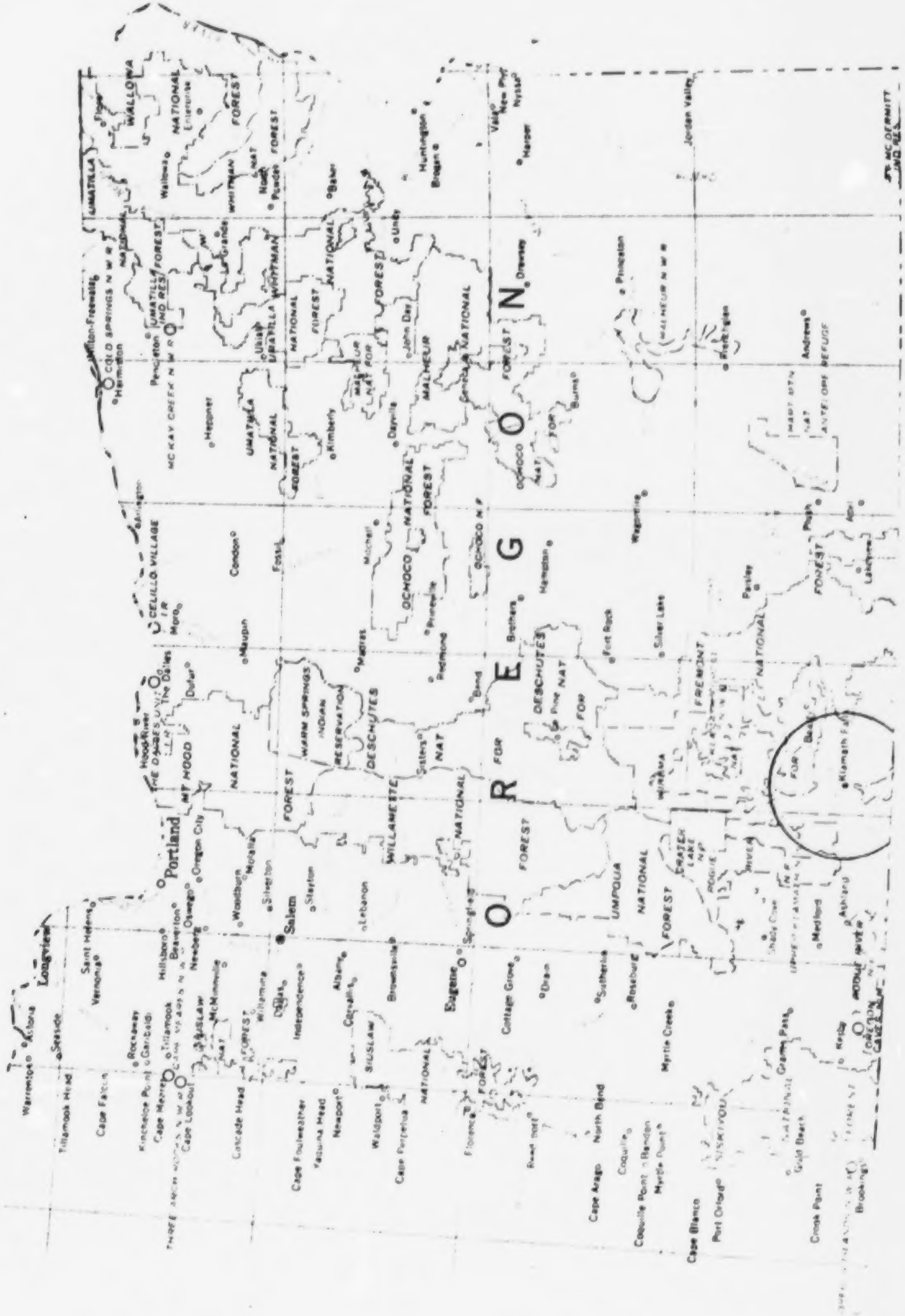
Ohio

	SMSA-County/ Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
A	Columbus SMSA Rickenbacker Air Force Base	Air Force	3@ 31 ea 4@ 31.2 ea.	winter 150 summer 30	overfired stoker	3-1952 4-1954	97	50	90.2	11.7	1208	
	Dayton SMSA Defense Electric Supply Ctr.	Air Force	2@ 20 ea 4@ 46 ea	avg 40	Stoker	2-1943 2-1953	50	50	(3.5)	24.6	545	does not include wast waste from Wright-Patterson AFB or Rickenbacken AFB
	Dayton SMSA Wright - Patterson Air Force Base	Air Force	1@ 11 1@ 30 4@ 36 ea 2@ 40 ea 4@ 60 ea 2@ 80 ea 4@ 100 ea 3@ 120 ea.	winter 839 summer 81	p.c. and traveling grate stoker		144	50	151	24.6	545	does not include waste from Defense Electric Supply Ctr. or Rickenbacker AFB
B	Cincinnati SMSA/VA Hospital	VA	3@ 24,500	max 28 min 8		1950 (Converted) 1970						gas and #2 incinerator
	Dayton SMSA/ VA Hospital	VA	2@ 20 ea 2@ 40 ea	avg. 40		1963 (converted) 1974						oil
C	Cleveland SMSA/ Brecksville VA Hospital	VA	3@ 35 ea									gas and #2 oil
	Ross County/ Chillicothe VA Hospital	VA	3@ 30 ea 1@ 24.4									gas and #2 oil


L A K E
Conneaut
Ashtabula
Painesville
Eastlake
Toledo
Maumee
Cedar Point
Oregon
Port Clinton
PERRYS VICTORY AND INTERNATIONAL PEACE MEMORIAL N M
Euclid
Cleveland
Cleveland Heights
Shaker Heights
Bryan
Napoleon
Bowling Green
Fremont
Sandusky
Lorain
Lakewood
Parma
Elyria
Warren
Niles
Defiance
Pauldin
Fostoria
Bellevue
Norwalk
Oberlin
Cuyahoga Falls
Ravenna
Medina
Akron
Kent
Youngstown
Tiffin
Ottawa
Findlay
Barberton
Alliance
Salem
Van Wert
Delphos
Lima
Upper Sandusky
Bucyrus
Shelby
Ashland
Massillon
East Palestine
Wooster
Canton
Lisbon
Mansfield
Galion
Marion
Celina
Wapakoneta
Kenton
Millersburg
East Liverpool
Toronto
Mt. Vernon
New Philadelphia
Uhrichsville
Steubenville
Bellefontaine
Sidney
Delaware
O H I O
Coshocton
Cadiz
Martins Ferry
Piqua
Marysville
Newark
Bellaire
Greenville
Troy
Urbana
Upper Arlington
Worthington
Columbus
Cambridge
Springfield
Zanesville
Fairborn
London
Dayton
Kettering
Xenia
Lancaster
New Lexington
Caldwell
Woodsfield
WAYNE N F
Oxford
Franklin
Washington CH
Circleville
Logan
Marietta
Middletown
Lebanon
Wilmington
MOUND CITY GROUP N M
Athens
Hamilton
Chillicothe
Cincinnati
Hillsboro
Waverly
Jackson
Pomeroy
Georgetown
Gallipolis
Portsmouth
WAYNE NAT FOR
Ironton

Oregon

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
A Klamath County/ Kingsley Field	Air Force	2@ 12.5ea. 1@ 14.5	winter: 14 summer: 7	spreader stoker		12	50	6.9	0.8	37	waste from Klamath Falls
C Portland SMSA/ VA Hosp.	VA	3@ 15.6 ea.									#6 oil
Douglas County /Roseburg VA Hosp.	VA	3@ 10 ea.									gas and #2 oil
Jackson County /White City VA Hosp	VA	4@ 10.4ea. 1@ 12.7									gas and #2 oil



O R E G O N
Portland
Salem
Eugene
Astoria
Tillamook
Oregon City
Hood River
The Dalles
Pendleton
La Grande
Baker
Bend
Burns
Roseburg
Medford
Klamath Falls
MT HOOD
WILLAMETTE
DESCHUTES
OCHOCO
MALHEUR
UMATILLA
WALLOWA
WHITMAN
UMPQUA
FREMONT
SIUSLAW
SISKIYOU
CRATER LAKE N.P.
WARM SPRINGS INDIAN RESERVATION
NATIONAL FOREST
CELILLO VILLAGE
COLD SPRINGS N W R
MALHEUR N W R
HART MTN NAT ANTELOPE REFUGE
MC DERMITT

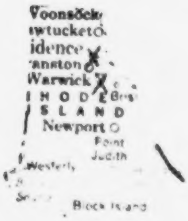
Pennsylvania

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
A	Monroe County/ Tobyhanna Army Depot	Army	4 @ 61 ea.	peak: 128 summer: 30	traveling grate stoker	1954	53	50	40	36	2	waste from Tobyhanna
B	Pittsburgh SMSA/VA Hosp.	VA	4 @ 24.3 ea.	avg: 30 min: 12		1950 (converted 1972)						gas
	Pittsburgh SMSA/New Cumberland Army Depot	Army	3 @ 50 ea.	min: 8 max: 120		1940 (converted 1973)						gas and oil
	Harrisburg SMSA/Carlisle Barracks	Army	2 @ 4 ea. 1 @ 9 1 @ 25									gas
C	Frankford Arsenal	Army	4 @ 20 ea.									
	Philadelphia SMSA/Naval Shipyard	Navy	5 @ 125 ea.									oil
	Philadelphia SMSA/ASO	Navy	1 @ 36 2 @ 40 ea.									#6 oil
	Altoona SMSA/ Altoona VA Hospital	VA	3 @ 12.5 ea.									gas and #2 oil
	Butler County Butler VA Hosp.	VA	3 @ 15.2 ea. 1 @ 21.5									gas and #2 oil

ERIE
Erie
Corry
Warren
Bradford
Smethport
ALLEGHENY
NATIONAL
FOREST
Kane
Port Allegany
Coudersport
Wellsboro
Towanda
Sayre
Montrose
Meadville
Titusville
Emporium
Canton
Carbondale
Tunkhannock
Franklin
Oil City
St. Marys
Ridgway
Dunmore
Scranton
Sharon
Mercer
Grove City
Clarion
Brookville
Brockway
Renovo
Williamsport
Laporte
Kingston
Wilkes-Barre
Plymouth
Farrell
DuBois
New Castle
Punxsutawney
Clearfield
Lock Haven
Milton
Bloomsburg
Stroudsburg
Ellwood City
Butler
Kittanning
Philipsburg
Lewisburg
Sunbury
Danville
Hazleton
PENNSYLVANIA
Beaver Falls
Monaca
Aliquippa
Ambridge
Ford City
Tyrone
State College
Mt. Carmel
Shenandoah
Tamaqua
Easton
Bethlehem
Indiana
Altoona
Lewistown
Pottsville
Allentown
McKees Rocks
Pittsburgh
Weirton
Duquesne
McKeesport
Huntingdon
Nanty Glo
Hollidaysburg
New Bloomfield
Emmaus
Quakertown
Lebanon
Reading
Clairton
Monessen
Greensburg
Latrobe
Johnstown
Mechanicsburg
Harrisburg
Steelton
Pottstown
Doylestown
Washington
Wheeling
Scottdale
Windber
Carlisle
Middletown
Ephrata
Phoenixville
Norristown
Levittown
Connellsville
Somerset
Bedford
Shippensburg
Columbia
Lancaster
PHILADELPHIA
Waynesburg
Uniontown
Chambersburg
York
West Chester
Chester
Meyersdale
Gettysburg
Hanover

Rhode Island

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
C	Newport County /Public Works Center	Navy	3@ 60 ea. 1@ 50 2@ 80 ea. 2@ 75 ea. 1@ 100									#6 oil
	Providence Warwick SMSA/ Providence VA Hosp.	VA	3@ 15.5 ea.									#6 oil


Woonsock
wtucket
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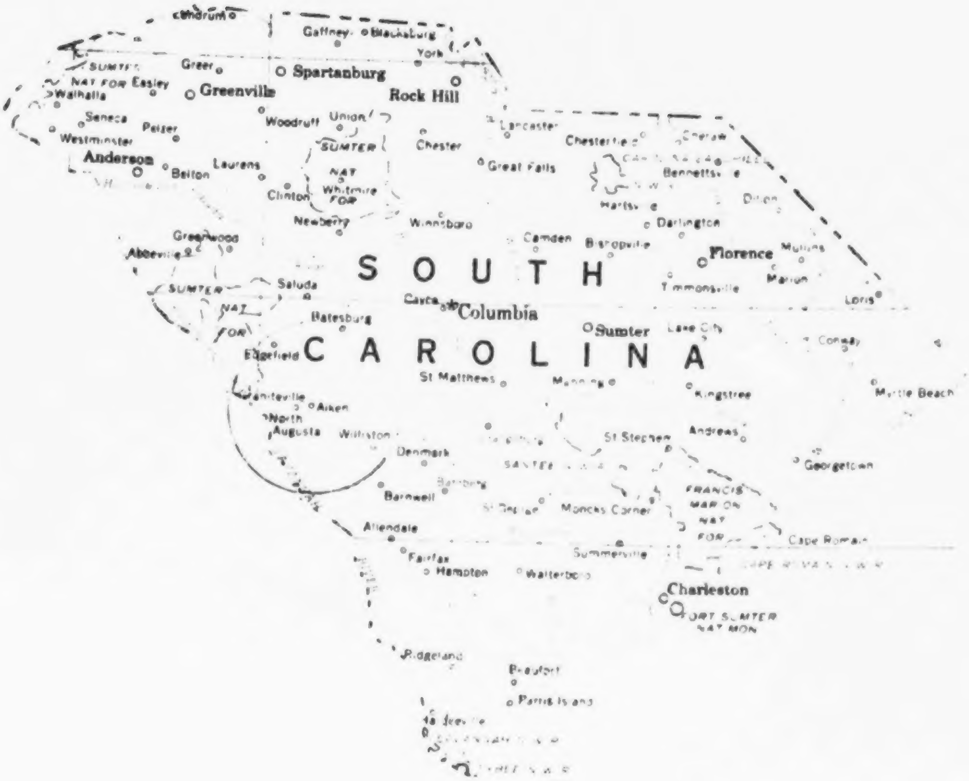
anston
Warwick
RHODE
ISLAND
Newport
Point
Judith
Westerly
Block Island

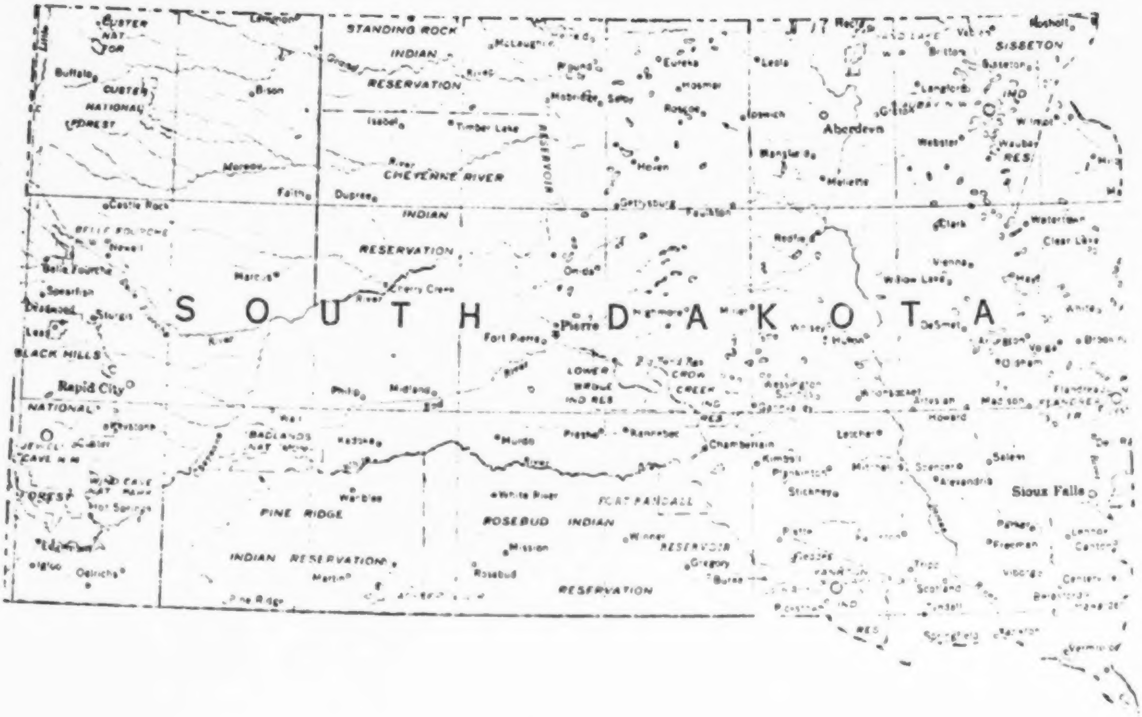
South Carolina

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
A	Augusta SMSA/Savannah River	ERDA	2,470 (19 boilers)	peak: 1,898 avg: 1,055	p.c. and spreader stokes		1095	50	1.3	0.4	204	waste from Aiken County, ESP's are under construction
C	Beaufort County/Parris Island	Navy	4 @ 50 ea.									natural gas
	Beaufort County/Naval Hospital	Navy	3 @ 21 ea.									natural gas
	Charleston SMSA/Charleston AFB	Air Force	4 @ 50 ea.									#6 fuel, oil
	Charleston SMSA/VA Hospital	VA	3 @ 20 ea.									gas and #2 oil
	Columbia SMSA/VA Hospital	VA	3 @ 16.2									gas and #2 oil
	Columbia SMSA/Fort Jackson	Army	5 @ 38 ea. 2 @ 39 ea. 2 @ 60 ea.									gas; boilers @ 39,000 #/hr are package types


SOUTH CAROLINA
Landrum
Gaffney
Blacksburg
York
SUMTER NAT FOR
Walhalla
Easley
Greer
Spartanburg
Greenville
Rock Hill
Seneca
Pelzer
Woodruff
Union
Lancaster
Westminster
SUMTER NAT FOR
Chester
Chesterfield
Cheraw
Anderson
Belton
Laurens
Great Falls
Bennettsville
Clinton
Whitmire
Hartsville
Dillon
Newberry
Winnsboro
Darlington
Greenwood
Abbeville
Camden
Bishopville
Florence
Mullins
Saluda
Marion
SUMTER NAT FOR
Timmonsville
Loris
Cayce
Columbia
Batesburg
Sumter
Lake City
Conway
Edgefield
St Matthews
Manning
Kingstree
Myrtle Beach
Graniteville
Aiken
North Augusta
Williston
St Stephen
Andrews
Denmark
Georgetown
Barnwell
Bamberg
FRANCIS MARION NAT FOR
St George
Moncks Corner
Allendale
Cape Romain
Summerville
Fairfax
Hampton
Walterboro
Charleston
FORT SUMTER NAT MON
Ridgeland
Beaufort
Parris Island
Hardeeville

South Dakota

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Refuse Supply (tpd) Other Fed.	Refuse Supply (tpd) Com.	Notes
Ft. Meade VA Hosp.	VA	3@ 17.5 ea.									gas and #2 oil
Fall River County/Hot Springs VA Hosp	VA	3@ 18.2 ea.									#2 oil
Sioux Falls SMSA/VA Hosp.	VA	1@ 16.3 1@ 24.6									gas and #2 oil

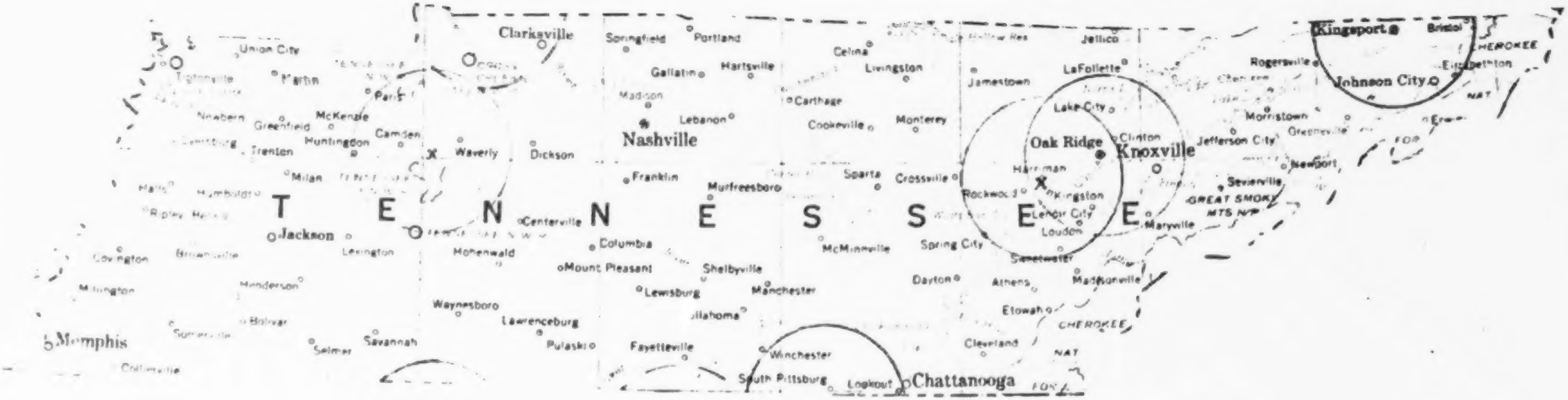

SOUTH DAKOTA
STANDING ROCK INDIAN RESERVATION
CHEYENNE RIVER INDIAN RESERVATION
SISSETON IND RES
CUSTER NATIONAL FOREST
BELLE FOURCHE
BLACK HILLS NATIONAL FOREST
BADLANDS NAT MON
PINE RIDGE INDIAN RESERVATION
ROSEBUD INDIAN RESERVATION
LOWER BRULE IND RES
CROW CREEK IND RES
FORT RANDALL RESERVOIR
WIND CAVE NAT PARK
JEWEL CAVE N M
Aberdeen
Pierre
Rapid City
Sioux Falls
Chamberlain
Mobridge
Gettysburg
Faulkton
Eureka
Lemmon
Bison
Buffalo
Timber Lake
Isabel
Dupree
Faith
Castle Rock
Newell
Belle Fourche
Spearfish
Deadwood
Sturgis
Lead
Philip
Midland
Kadoka
Murdo
Presho
Kennebec
White River
Mission
Rosebud
Martin
Pine Ridge
Wanblee
Hot Springs
Edgemont
Oelrichs
Igloo
Custer
Fort Pierre
Onida
Highmore
Miller
Redfield
Huron
De Smet
Clark
Watertown
Clear Lake
Webster
Waubay
Wilmot
Britton
Sisseton
Langford
Groton
Ipswich
Leola
Mellette
Hoven
Roscoe
Selby
Bowdle
Wessington Springs
Kimball
Plankinton
Stickney
Mitchell
Alexandria
Salem
Madison
Howard
Artesian
Letcher
Parker
Freeman
Lennox
Canton
Centerville
Viborg
Beresford
Vermillion
Tyndall
Scotland
Springfield
Tripp
Platte
Geddes
Pickstown
Winner
Gregory
Burke
Vienna
Willow Lake
Arlington
Volga
Brookings
Flandreau
Oldham
Hayti
Estelline
Roslyn
Veblen
Rosholt

Tennessee

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
A	Memphis/Allen	TVA	3@ 330 MW ea		Cyclone	1958 2-1959		50				have ESP-70 to 98.7% efficient; wet bottom
	Knoxville/ Bull Run	TVA	950 MW		p.c.	1967		50				have ESP- 81% efficient
	Stewart Coun County/ Cumberland	TVA	under construction									
	Summer County /Gallaten	TVA	4- total: 1255.2 MW		p.c.	1956 1957 2-1959		50				have mechanical collector/ESP efficient 60/92 for 2 and 40/90 for 2
	Hawkins County/ Sevier	TVA	4@ 205.8 MW ea		p.c.	2-1955 1956 1957		50				have mechanical collector: 50% efficient
	Humphreys County/ Johnsville	TVA	6@ 132.3 MW ea 4@ 172.8 MW ea		p.c.	2-1951 3-1952 1-1953 1-1958 3-1959		50				mechanical collector: 1 @ 50% and 5@ 60% efficient
	Roane County/ Kingston	TVA	9- total 1700 MW		p.c.	5-1954 4-1955		50				mechanical collectors/ESP efficiencies: 60/80 for 4 and 50/85 for 5
	Rhea County/ Watts Barr	TVA	4@ 60 MW ea		p.c.	1969						wet and dry bottom; ESP- 95% efficient

Tennessee

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Refuse Supply (tpd) Other Fed.	Refuse Supply (tpd) Com.	Notes
A	Sullivan County/ Holston AAP	Army	3@ 185ea. 3@ 135 ea.	avg 500	traveling	1942	425.5	50	1.8	0.5	76	have 3 ESPs installed and 3 ESPs out for bids; waste from Kingsport
	Oakridge N National	ERDA	4@ 40 ea 4@ 250 ea 1@ 100 4@ 75 ea 3@ 125 ea	avg 577	5-pc 11-stokers		858	50	14	1.4	63.5	waste from Oak Ridge
C	/Volunteer AAF	Army	2@ 150 ea									gas, package boilers
	Memphis SMSA/ Naval Air Station	Navy	4@ 50 ea									
	Tullahoma County/ AEDC	Air Force	1@ 24 3@ 72 ea 1@ 50.4									gas
	Memphis SMSA/ VA Hospital	VA	2@ 38 ea 1@ 20									gas and #2 oil
	Rutherford County/ Murfreesboro VA Hospital	VA	3@ 25 ea									gas and #2 oil
	Mountain Home VA Hospital	VA	3@ 38 ea 1@ 21									gas and #2 oil


TENNESSEE
Union City
Tiptonville
Martin
Paris
Newbern
Greenfield
McKenzie
Camden
Huntingdon
Trenton
Milan
Halls
Humboldt
Ripley
Jackson
Covington
Brownsville
Lexington
Millington
Henderson
Bolivar
Memphis
Somerville
Selmer
Savannah
Collierville
Clarksville
Waverly
Dickson
Centerville
Hohenwald
Waynesboro
Lawrenceburg
Pulaski
Springfield
Portland
Gallatin
Hartsville
Madison
Lebanon
Nashville
Franklin
Murfreesboro
Columbia
Mount Pleasant
Shelbyville
Lewisburg
Manchester
Tullahoma
Fayetteville
Winchester
South Pittsburg
Celina
Livingston
Carthage
Cookeville
Monterey
Sparta
Crossville
McMinnville
Spring City
Dayton
Jamestown
Jellico
LaFollette
Lake City
Oak Ridge
Clinton
Knoxville
Harriman
Rockwood
Kingston
Lenoir City
Loudon
Sweetwater
Athens
Madisonville
Etowah
Cleveland
Lookout
Chattanooga
CHEROKEE
NAT
FOR
Maryville
Sevierville
GREAT SMOKY MTS NP
Newport
Jefferson City
Morristown
Greeneville
Rogersville
Kingsport
Bristol
Johnson City
Elizabethton
Erwin

Texas

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
B	El Paso SMSA/ Ft. Bliss	Army	3 @ 8.4 ea			1941						gas
C	Horn AAP/Long	Army	4 @ 95 ea									gas
	Red River County/Red River AAP	Army	4 @ 28 2 @ 32									gas
	Corpus Christi SMSA/Naval Air Station	Navy	4 @ 50 ea									gas; boilers scheduled for replacement
	Fort Worth SMSA AF Plant 4 (ACFJ)	Air Force	4 @ 100 ea 1 @ 150									gas
	San Antonio SMSA/Brooks AFB	Air Force	3 @ 30 ea 1 @ 60 ea									gas
	San Antonio SMSA/Kelly AFB	Air Force	2 @ 52 2 @ 56									gas
	Amarillo SMSA VA Hospital	VA	2 @ 67 ea 1 @ 7.55									gas and #2 oil
	Howard County/ Big Springs VA Hospital	VA	3 @ 12.8 ea									gas and #6 oil

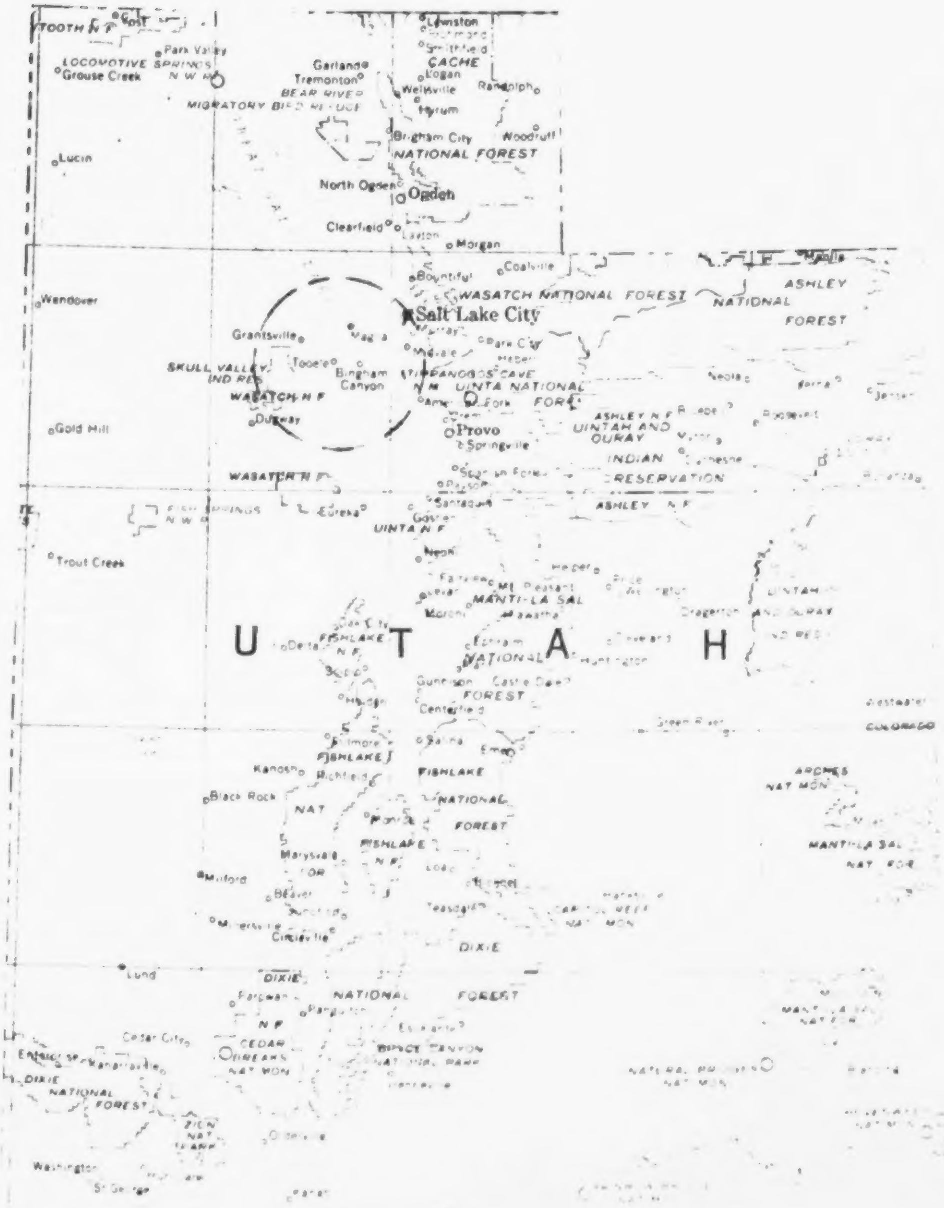
Texas

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
/Bonham VA Hospital	VA	3 @ 96 ea									gas and #2 oil
C Houston SMSA/ VA Hospital	VA	3 @ 24.2 ea									gas and #2 oil
Kerr County/ Kerrville VA Hospital	VA	2 @ 89 ea 1 @ 45									gas and #2 oil
Falls County/ Marlin VA Hospital	VA	3 @ 12.1 ea									gas and #2 oil
Bell County/ Temple VA Hospital	VA	3 @ 35 ea									gas and #2 oil

L. Meredith
Canadian River
Amarillo
PALO DURO CANYON
ROCK ISLAND
LLANO ESTACADO
White River
Lubbock
Wichita Falls
L. Kemp
Hubbard Creek Res.
Abilene
CALLAHAN DIVIDE
Midland
Odessa
GUADALUPE PK. 8,751 FT.
HIGHEST POINT IN TEXAS
Pecos River
DAVIS MTS.
STOCKTON PLATEAU
GLASS MTS.
EDWARDS PLATEAU
Devils R.
Rio Grande
BIG BEND NAT. PARK
CHISOS MTS.
Del Rio
San Angelo
Colorado River
BRADY MTS.
BLUE MTS. 2,217 FT.
LAMPASAS
CUT PLAINS
Ft. Worth
Dallas
Garza-Little Elm F. C. Res.
Sulphur River
Lake Texarkana
Texarkana
Lake O' the Pines
Lake Tawakoni
Joe B. Hogsett Res.
Shrevep
L. Whitney
Waco
Brazos River
Trinity River
Neches River
Sam Rayburn Res.
AUSTIN
Beaumont
Houston
Port Arthur
Galveston Bay
Galveston
GALVESTON ISLAND
San Antonio
Frio River
Guadalupe R.
Nueces River
NUECES
PLAINS
Matagorda Bay
MATAGORDA PENINSULA
San Antonio Bay
MATAGORDA ISLAND
Aransas Bay
Laredo
Corpus Christi
Baffin Bay
PADRE ISLAND NAT'L SEASHORE
PADRE ISLAND
Falcon Res.
Rio Grande
Laguna Madre
Brownsville
Matamoros

Utah

	SMSA-County/ Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
B	Tooele County/ Tooele Army Depot	Army	3@ 25 ea 2@ 21 ea 1 @ 28									25,000 and 28000# hr boilers are package type boiler; oil
C	Salt Lake City SMSA/ Hill AFB	Air Force	3@ 10 ea 2@ 30 ea 6@ 40 ea 4@ 50 ea									gas
	Salt Lake City SMSA AF plant 81 (ACJN)	Air Force	3@ 27 ea									natural gas
	AF Plans 78 (ACJK)	Air Force	2@ 57 ea									#5 fuel oil
	Salt Lake City SMSA/ VA Hospital	VA	3@ 20.8 ea.									gas and #2 oil



U T A H
Salt Lake City
Ogden
Provo
Logan
Brigham City
North Ogden
Clearfield
Layton
Morgan
Bountiful
Coalville
Murray
Midvale
Park City
Heber
Grantsville
Magna
Tooele
Bingham Canyon
Dugway
Wendover
Gold Hill
Lucin
Grouse Creek
Park Valley
Garland
Tremonton
Wellsville
Hyrum
Randolph
Woodruff
Lewiston
Richmond
Smithfield
CACHE NATIONAL FOREST
LOCOMOTIVE SPRINGS N W R
BEAR RIVER MIGRATORY BIRD REFUGE
WASATCH NATIONAL FOREST
ASHLEY NATIONAL FOREST
SKULL VALLEY IND RES
WASATCH N F
TIMPANOGOS CAVE N M
UINTA NATIONAL FOREST
ASHLEY N F
UINTAH AND OURAY INDIAN RESERVATION
Springville
Spanish Fork
Payson
Santaquin
Eureka
Goshen
UINTA N F
Nephi
FISH SPRINGS N W R
Trout Creek
Helper
Price
Mt Pleasant
MANTI-LA SAL NATIONAL FOREST
Moroni
Ephraim
Delta
FISHLAKE N F
Scipio
Gunnison
Castle Dale
Centerfield
Huntington
Green River
Fillmore
Salina
Emery
Kanosh
Richfield
Black Rock
FISHLAKE NATIONAL FOREST
Marysvale
Milford
Beaver
Minersville
Circleville
Loa
Teasdale
CAPITOL REEF NAT MON
DIXIE NATIONAL FOREST
Lund
Panguitch
Cedar City
CEDAR BREAKS NAT MON
BRYCE CANYON NATIONAL PARK
Escalante
Kanarraville
Enterprise
ZION NAT PARK
Washington
St George
Orderville
Kanab
NATURAL BRIDGES NAT MON
ARCHES NAT MON
MANTI-LA SAL NAT FOR
Roosevelt
Vernal
Neola
Jensen
Duchesne
Myton
Dragerton
Westwater
COLORADO

Vermont

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
C	Windson County/White River Junction VA Hospital	VA	1@ 4.8 2@ 10.8 ea.									#6 oil

VERMONT
Richford
Newport
Swanton
Coaticook
Saint Albans
Orleans
Barton
Morrisville
Burlington
Lyndonville
Hardwick
Saint Johnsbury
Waterbury
Montpelier
Vergennes
Northfield
Barre
Middlebury
Randolph
Brandon
White River Junction
GREEN
Fair Haven
Woodstock
Rutland
MTN
Windsor
NAT
Springfield
FOR
Bellows Falls
Brattleboro
Bennington

Virginia

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
A	Washington, D.C SMSA/Marine Corp Ed.&Dev. Center	Navy	2@ 28 ea. 2@ 45 ea. 1@ 55 1@120	winter: 210	P.C.	1928	87	50	10-100	2.2	2.2	Plan to install ESP in 3-4 years, waste from Quantico, VA.
	Montgomery County/Radford AFB	Army	6@ 30 ea. 5@ 150 ea.	winter: 350-400	Stoker P.C.		412	50	2	0.15	225	Installing ESP's; waste from Radford, VA.
	Wash., D.C. SMSA/Virginia Heating & Refrig. Plant 1-4 [illegible] 2 A	GSA	4 @ 80 ea. 1 @ 125	avg. 67.6	stoker	1938 1974	142	50	0.7	188.6	1814	only have mechanical collectors. #6 fuel oil
B	Washington, D.C SMSA/Ft. Belvoir	Army	3@ 15.2 ea 2@ 19 ea.	min. 15		1956 1941						oil
	Isle of Wright County/Ft. Eustis	Army	1@ 29 2@ 30 ea. 1@ 37 4@24 ea.	min. 35								oil, 30,000 #/hr boilers are inactive
	Prince George County/Ft. Lee	Army	1@ 28 1@ 33									oil
	Washington, D.C. /Cameron Stat.	Army	6@ 13 ea.									oil
C	Norfold Ports-mouth SMSA/ Oceana Naval Air Station	Navy	1@ 30 3@ 60 ea.									#3 fuel oil
	Norfolk-Ports-mouth SMSA/ Navy Public Work Center	Navy	2@ 83.3ea.									#2 oil

Virginia

SMSA-County/ Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
C Norfolk-Portsmouth SMSA/ Navy Regional Medical Center	Navy	1@23.86 3@35.79ea.									#6 oil
Newport News-Hampton SMSA/ Naval Weapons Station	Navy	2@ 40 ea.									#5 fuel oil
Ft Myer	Army	5@ 40 ea.									oil; crowded
Newport News-Hampton SMSA/ Hampton VA Hospital	VA	3@ 30 ea.									gas and #2 oil
Richmond SMSA/ VA Hospital	VA	4@ 30 ea.									gas and #2 oil
Roanoak SMSA/ Salem VA Hosp.	VA	1@ 24.4 3@ 25 ea.									gas and #2 oil
Wash.,D.C. SMSA/McLean Heating & Refrig.Plant	GSA	3@ 50 ea.									#6 fuel oil

VIRGINIA
BAY
Chincoteague
Accomac
Cape Charles
Virginia Beach
Chesapeake
Norfolk
Portsmouth
Suffolk
Hampton
Newport News
Williamsburg
Gloucester
West Point
Lancaster
Alexandria
Arlington
Leesburg
Fredericksburg
Tappahannock
Richmond
Petersburg
Charlottesville
Staunton
Lynchburg
Danville
Roanoke
SHENANDOAH

Washington

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
									Fac.	Other Fed.	Com.	
A	Benton County/ Richland, Washington	ERDA	1@ 25 1@ 30 9@ 80 ea.	min:77 avg 145 max. 330	stoker		136.5	50	(9)	0.4	59	waste from Richland
B	Tacoma SMSA/ Ft. Lewis	Army	4@ 10 ea. 2@ 14 ea. 2@ 25 ea.									originally coal-now oil
C	Seattle SMSA/ Puget Sound Naval Shipyard	Navy	4@ 77.4ea. 1@ 136 1@ 88.5 1@ 197									#6 oil
A	Seattle SMSA/ Naval Support Activity	Navy	2@ 17 ea. 1@ 26.5 1@ 30									#2 oil
	Spokane SMSA/ Fairchild AFB	Air Force	3@ 110ea. 1@ 120									gas. first 3 were designed to burn coal if desired
	Tacoma SMSA/ McChord AFB	Air Force	1@ 50 2@ 100ea.									gas
C	America Lake VA Hospital	VA	1@ 9.4 2@ 12 ea.									#6 oil
	Seattle SMSA VA Hospital	VA	3@ 9 ea.									
	Walla Walla County/Walla Walla Va Hosp.	VA	3@ 10.7ea.									

WASHINGTON
MOUNT BAKER NATIONAL FOREST
OKANOGAN NATIONAL FOREST
COLVILLE NATIONAL FOREST
COLVILLE INDIAN RESERVATION
WENATCHEE NATIONAL FOREST
SNOQUALMIE NATIONAL FOREST
MT RAINIER NAT PARK
GIFFORD PINCHOT NATIONAL FOREST
YAKIMA INDIAN RESERVATION
OLYMPIC NATIONAL PARK
OLYMPIC NATIONAL FOREST
SPOKANE IND RES
Bellingham
Everett
Seattle
Bremerton
Tacoma
Olympia
Spokane
Wenatchee
Ellensburg
Yakima
Richland
Pasco
Walla Walla
Vancouver
Aberdeen
Chehalis
Centralia
Kelso
Goldendale
Sunnyside
Toppenish
Wapato
Prosser
Colfax
Pomeroy
Clarkston
Dayton
Davenport
Ritzville
Odessa
Ephrata
Quincy
Moses Lake
Grand Coulee
Coulee Dam
Chelan
Omak
Okanogan
Oroville
Colville
Newport
Cheney
Medical Lake
Raymond
Long Beach
Cape Disappointment
Port Townsend
Anacortes
Mount Vernon
Edmonds
Renton
Kent
Auburn
Puyallup
Morton
Castle Rock
Woodland
Camas
Cathlamet
Montesano
Cosmopolis
Hoquiam
Shelton

West Virginia

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Other Fed.	Com.	Notes
Raleigh County/ Beckley VA Hosp.	VA	3@ 7.7 ea.									gas and #5 oil
Huntington-Ashland SMSA/ Huntington VA Hosp.	VA	1@ 6.9 2@ 8.625ea.									gas and #2 oil
Berkley County/ Martinsburg VA Hosp.	VA	3@ 35 ea. 1@ 23.5									#2 oil

WEST VIRGINIA
MONONGAHELA NATIONAL FOREST
Wh
Moun
New Martinsville
Paden City
Mannington
Morganto
Sistersville
Shinnston
Fairmont
Saint Marys
Salem
Grafton
Vienna
Parkersburg
Clarksburg
Harrisville
Philippi
Parsons
Weston
Elizabeth
Glenville
Buckhannon
Elkins
Grantsville
Point Pleasant
Ripley
Spencer
Sutton
Webster Springs
Clay
Huntington
Kenova
Saint Albans
Dunbar
Charleston
Summersville
Wayne
Chesapeake
Montgomery
Richwood
Marlinton
Madison
Fayetteville
Oak Hill
Logan
Mount Hope
White Sulphur Springs
Williamson
Beckley
Ronceverte
Pineville
Mullens
Hinton
Welch
Keystone
Princeton
Ward
Pocahontas
Berkeley Springs
Martinsburg
Keyser
Romney
Moorefield
Petersburg
Franklin

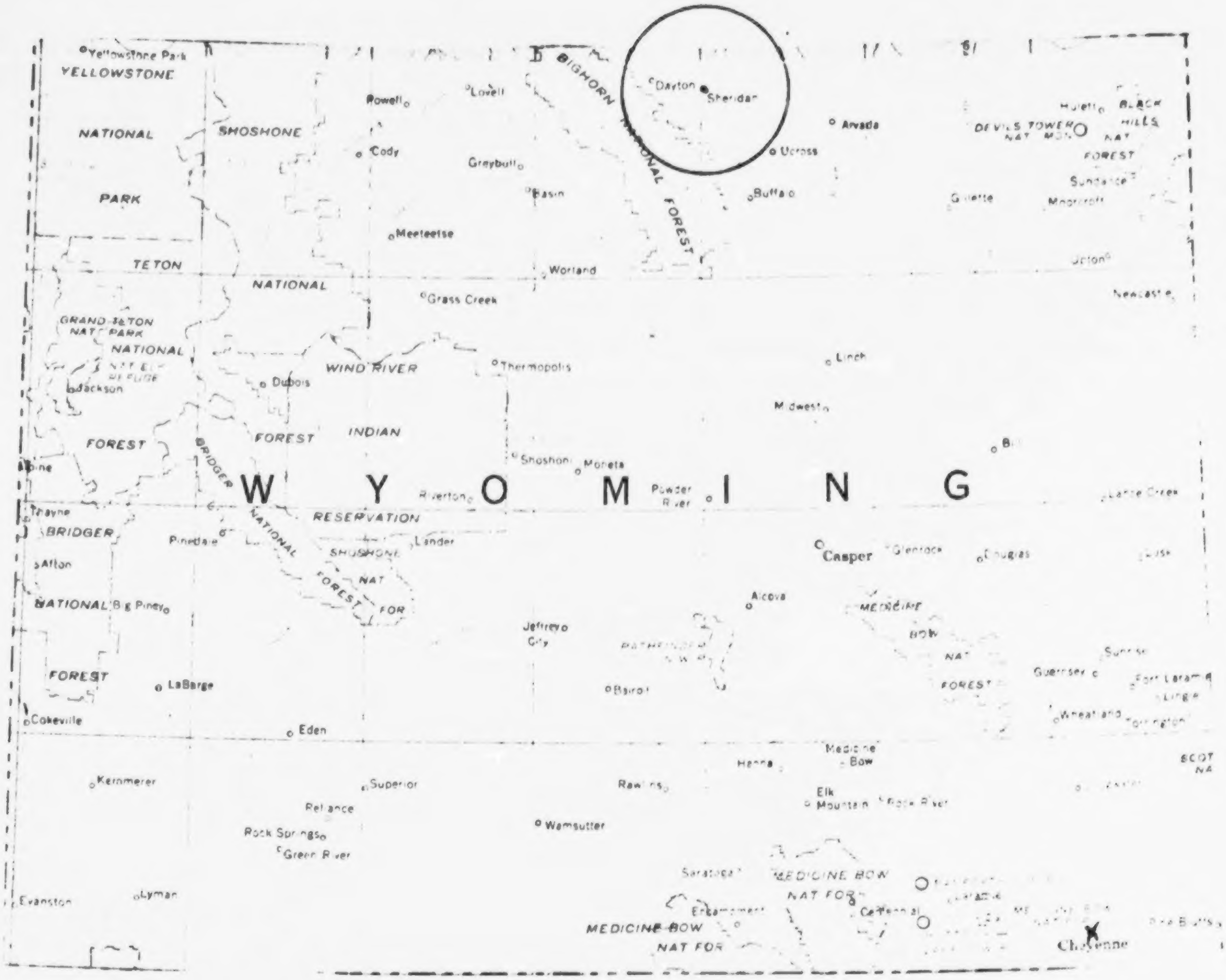
Wisconsin

SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd)			Notes
								Fac.	Other Fed.	Com.	
B Monroe County/ Tomah VA Hosp.	VA	4@ 18 ea.	avg. 23		1945						gas
Sauk County/ Badger AAP	Army	5@ 35 ea.	avg. 50		1942						#2 oil
C Madison SMSA/ Madison VA Hosp.	VA	3@ 19 ea.									gas and #2 oil
Wood VA Hosp.	VA	3@ 30.2 ea 3@ 30 ea.									hot water;gas&#6 oil steam,gas & #6 oil

APOSTLE ISLANDS
Sand Island
Bark Point
RED CLIFF IN
Bayfield
Madeline
Superior
Washburn
BAD RIVER I R
Iron River
Ashland
Solon Springs
Hurley
CHEQUAMEGON
Mellen
NATIONAL
FOREST
LAC DU FLAMBEAU IND RES
Land O'Lakes
Hayward
Park Falls
Eagle River
NICOLET
Florence
Spooner
Shell Lake
CHEQUAMEGON N F
Niagara
Grantsburg
CHIPPEWA COMMUNITIES I R
LAC COURTE OREILLE I R
Phillips
NATIONAL
Rhinelander
MOLE LAKE I R
Laona
Crandon
POTAWATOMI I R
Rice Lake
Saint Croix Falls
Barron
Ladysmith
Tomahawk
Amery
Chetek
CHEQUAMEGON NAT FOR
FOREST
Cornell
Antigo
Crivitz
New Richmond
Bloomer
Medford
Merrill
Peshtigo
Marinette
Sister Bay
Hudson
Menomonie
Chippewa Falls
Owen
Wausau
STOCKBRIDGE-MUNSEE I R
Oconto
River Falls
Eau Claire
Schofield
Shawano
Sturgeon Bay
Ellsworth
WISCONSIN
Durand
Marshfield
Clintonville
ONEIDA IND RES
Algoma
Mondovi
Neillsville
Stevens Point
Green Bay
Whitehall
Wisconsin Rapids
New London
De Pere
Kewaunee
Alma
WINNEBAGO I R
Waupaca
Little Chute
Arcadia
Black River Falls
Appleton
Kaukauna
NECEDAH N W R
Menasha
Neenah
Two Rivers
TREMPEALEAU N W R
Necedah
Wautoma
Berlin
Chilton
Manitowoc
Onalaska
Sparta
Tomah
Adams
Oshkosh
La Crosse
Ripon
Elroy
Mauston
Fond du Lac
Plymouth
Sheboygan
Wisconsin Dells
Viroqua
Reedsburg
Mayville
Baraboo
Portage
West Bend
Beaver Dam
Hartford
Richland Center
Columbus
Port Washington
Watertown
Cedarburg
Boscobel
Madison
Oconomowoc
Wauwatosa
Milwaukee
Prairie du Chien
Middleton
Jefferson
Dodgeville
Waukesha
West Allis
Stoughton
Lancaster
Fort Atkinson
South Milwaukee
Mineral Point
Edgerton
Whitewater
Racine
Darlington
Monroe
Janesville
Kenosha
Beloit

Wyoming

	SMSA-County/Plant	Agency	Rated Capac. 1,000#/hr.	Load 1,000#/hr.	Type of Firing	Date of Instal.	Refuse Capac. tpd.	Comb. Firing %	Refuse Supply (tpd) Fac.	Refuse Supply (tpd) Other Fed.	Refuse Supply (tpd) Com.	Notes
A	Sheridan County/Sheridan VA Hosp	VA	3@ 18.3 ea.									
C	Laramie County/Cheyenne VA Hosp.	VA	1@ 5.2 2@ 6.9 ea.									gas & #2 oil


WYOMING
Yellowstone Park
YELLOWSTONE NATIONAL PARK
SHOSHONE
TETON NATIONAL
GRAND TETON NAT PARK
NATIONAL
NAT ELK REFUGE
FOREST
Jackson
Alpine
Thayne
BRIDGER NATIONAL FOREST
Afton
Big Piney
Pinedale
LaBarge
Cokeville
Kemmerer
Evanston
Lyman
Eden
Superior
Reliance
Rock Springs
Green River
Powell
Lovell
Cody
Greybull
Basin
Meeteetse
Worland
Grass Creek
Thermopolis
WIND RIVER INDIAN RESERVATION
FOREST
Dubois
BRIDGER NATIONAL FOREST
Shoshoni
Moneta
Riverton
Lander
SHOSHONE NAT FOR
Jeffrey City
Bairoil
Wamsutter
Rawlins
BIGHORN NATIONAL FOREST
Dayton
Sheridan
Ucross
Arvada
Buffalo
Linch
Midwest
Powder River
Casper
Glenrock
Douglas
Alcova
MEDICINE BOW NAT FOREST
Hanna
Medicine Bow
Elk Mountain
Rock River
Saratoga
Encampment
Centennial
MEDICINE BOW NAT FOR
Laramie
Cheyenne
DEVILS TOWER NAT MON
Hulett
BLACK HILLS NAT FOREST
Sundance
Gillette
Moorcroft
Upton
Newcastle
Lance Creek
Lusk
Guernsey
Sunrise
Fort Laramie
Lingle
Wheatland
Torrington
Pine Bluffs

APPENDIX B

STATE: ALASKA

FACILITY Eielson AFB

	I	II	III	
Maximum refuse rate at 50% firing	169	267	172	tpd

Available refuse from facility 31.2 tpd

from other fed. fac. 2.0 tpd

from city 56 tpd

from county 103 tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1357232	25.01		25.01
Fac. and other fed. fac.	1363080	23.88	6.25	30.13
Fac. and city	1439104	16.14	6.00	29.88
County	1456648	15.23	9.10	24.33

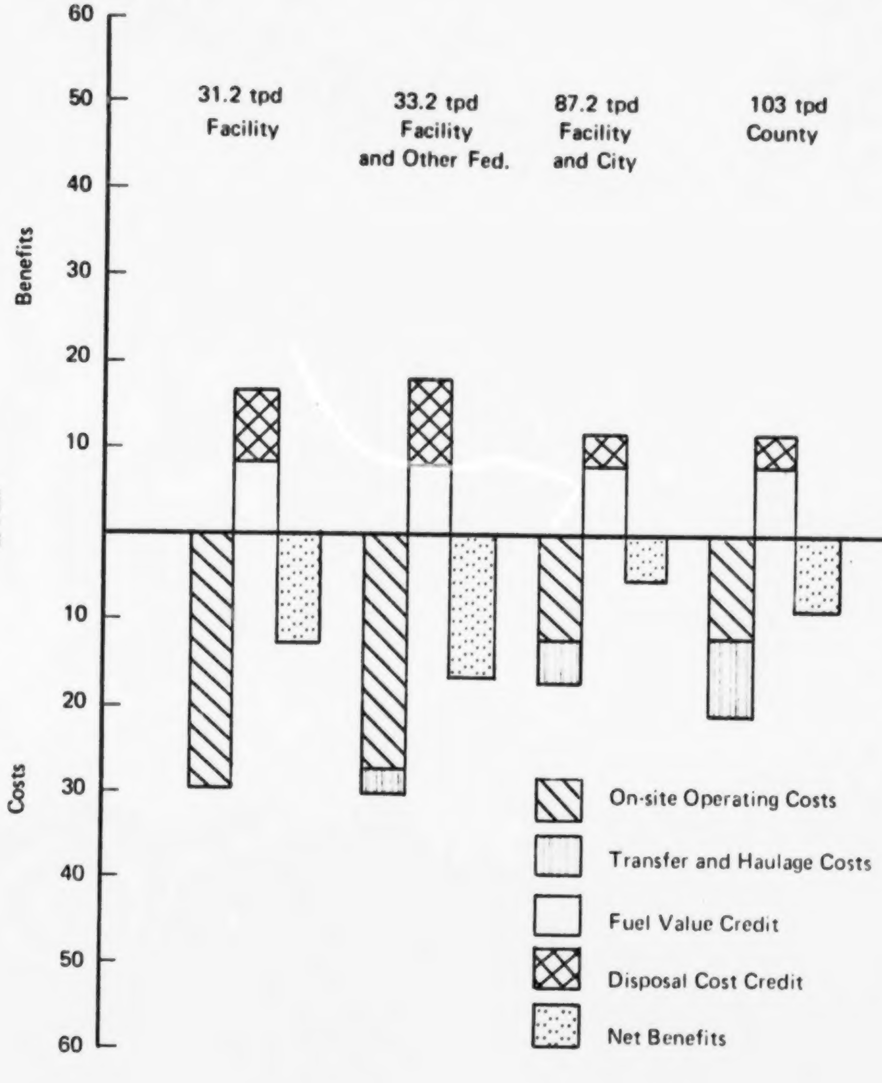
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1798333	29.53		29.53
Fac. and other fed. fac.	1804180	28.01	6.25	34.26
Fac. and city	1962076	13.29	4.20	17.49
County	2227814	12.80	8.45	21.25

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
1798267	14.00	8.52	22.58

EIELSON AFB – TYPE II



STATE: COLORADO

FACILITY Pueblo Army Depot

	I	II	III	
Maximum refuse rate at 50% firing	36	60	39	______ tpd

Available refuse from facility (33) tpd

from other fed. fac. (140) + 3.4 tpd

from city 218 tpd

from county ______ tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	780407	15.84		15.84
Fac. and other fed. fac.	789179	15.04	6.50	21.54
Fac. and city	789179	15.04	4.50	19.54
County				

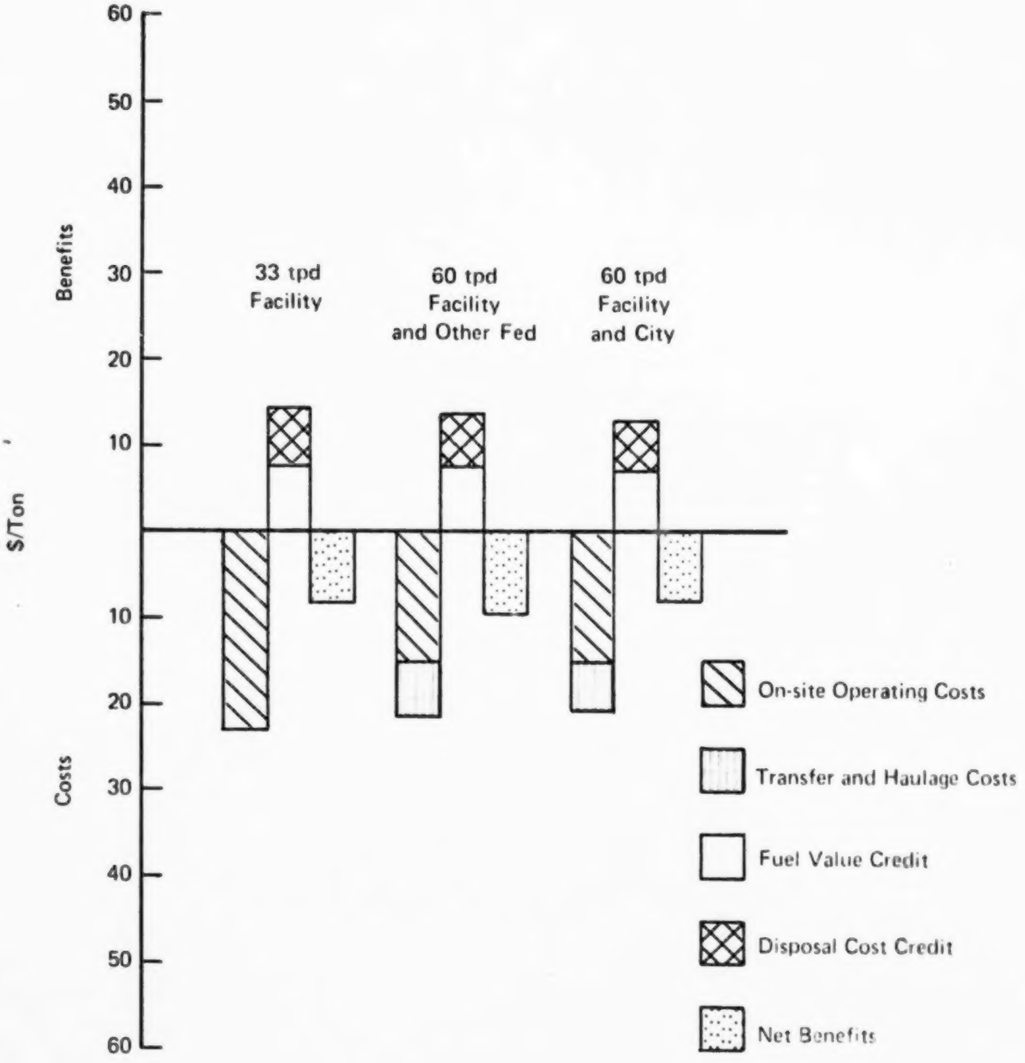
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1221507	22.57		22.57
Fac. and other fed. fac.	1300455	15.47	7.70	23.17
Fac. and city	1300455	15.47	5.20	20.67
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
717251	14.00	17.11	31.11

PUEBLO ARMY DEPOT – TYPE II



STATE: District of Columbia

FACILITY Steam Plant serving all buildings on Capital Hill

	I	II	III	
Maximum refuse rate at 50% firing	88	146.7	94.3	______ tpd

Available refuse from facility 15.2 tpd (legislative branch of Gov't.)

from other fed. fac. 188.6 tpd

from city ______ tpd

from county ______ tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	423845	17.83		17.83
Fac. and other fed. fac.	636712	8.25	3.15	11.40
Fac. and city				
County				

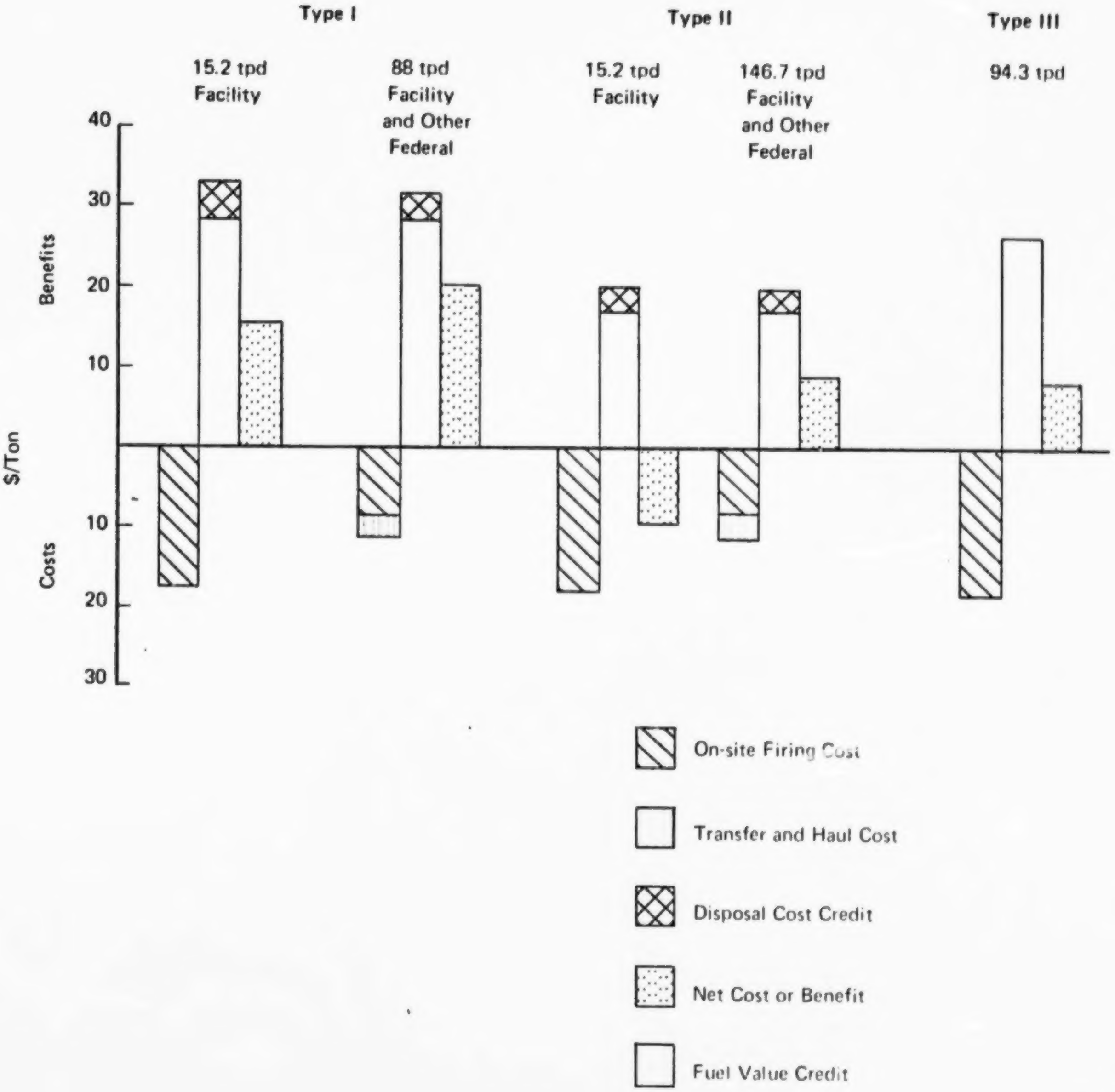
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	864945	29.85		29.85
Fac. and other fed. fac.	1399638	7.82	2.60	10.42
Fac. and city				
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
574433	14.00	5.00	19.00

CAPITAL HILL STEAM PLANT



STATE: District of Columbia

FACILITY Central Heating and Refrigeration Plant

	I	II	III	
	229	382	246	
Maximum refuse rate at 50% firing				tpd

Available refuse	from facility		tpd
	from other fed. fac.	188.6	tpd
	from city	1814	tpd
	from SMSA	6410	tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility				
Fac. and other fed. fac.	1014558	7.39	2.30	9.69
Fac. and city	1068573	7.06	2.10	9.16
County				

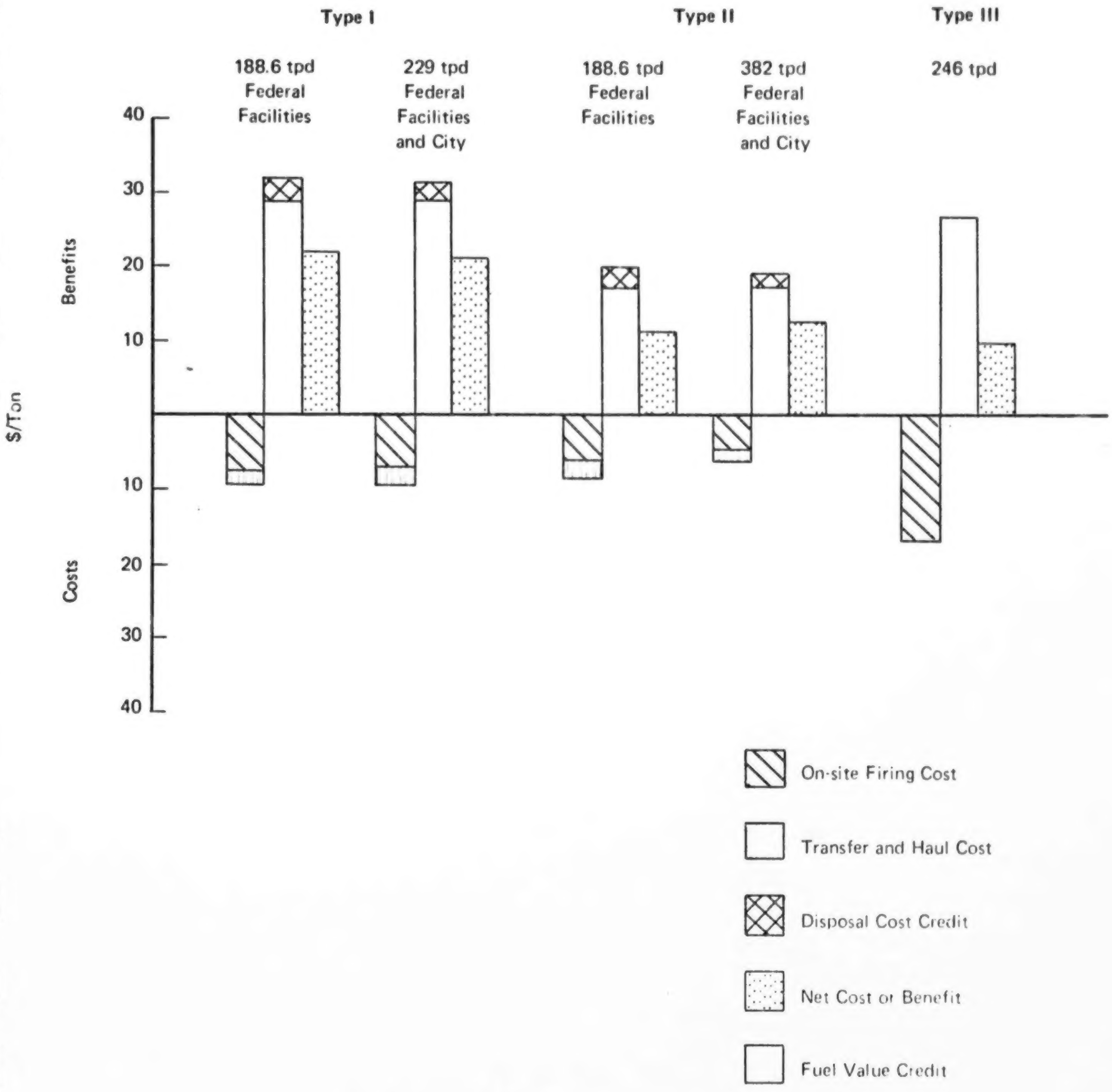
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility				
Fac. and other fed. fac.	1455658	6.15	2.30	8.45
Fac. and city	1714234	4.66	1.90	6.56
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
1010602	14.00	2.87	16.87

CENTRAL HEATING AND REFRIGERATION PLANT



STATE: District of Columbia

FACILITY West Heating Plant

	I	II	III	
	172	287	184	
Maximum refuse rate at 50% firing				____ tpd

Available refuse from facility ____ tpd

from other fed. fac. 188.6 tpd

from city 1814 tpd

from SMSA 6410 tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility				
Fac. and other fed. fac.	992364	7.57	2.45	10.02
Fac. and city				
County				

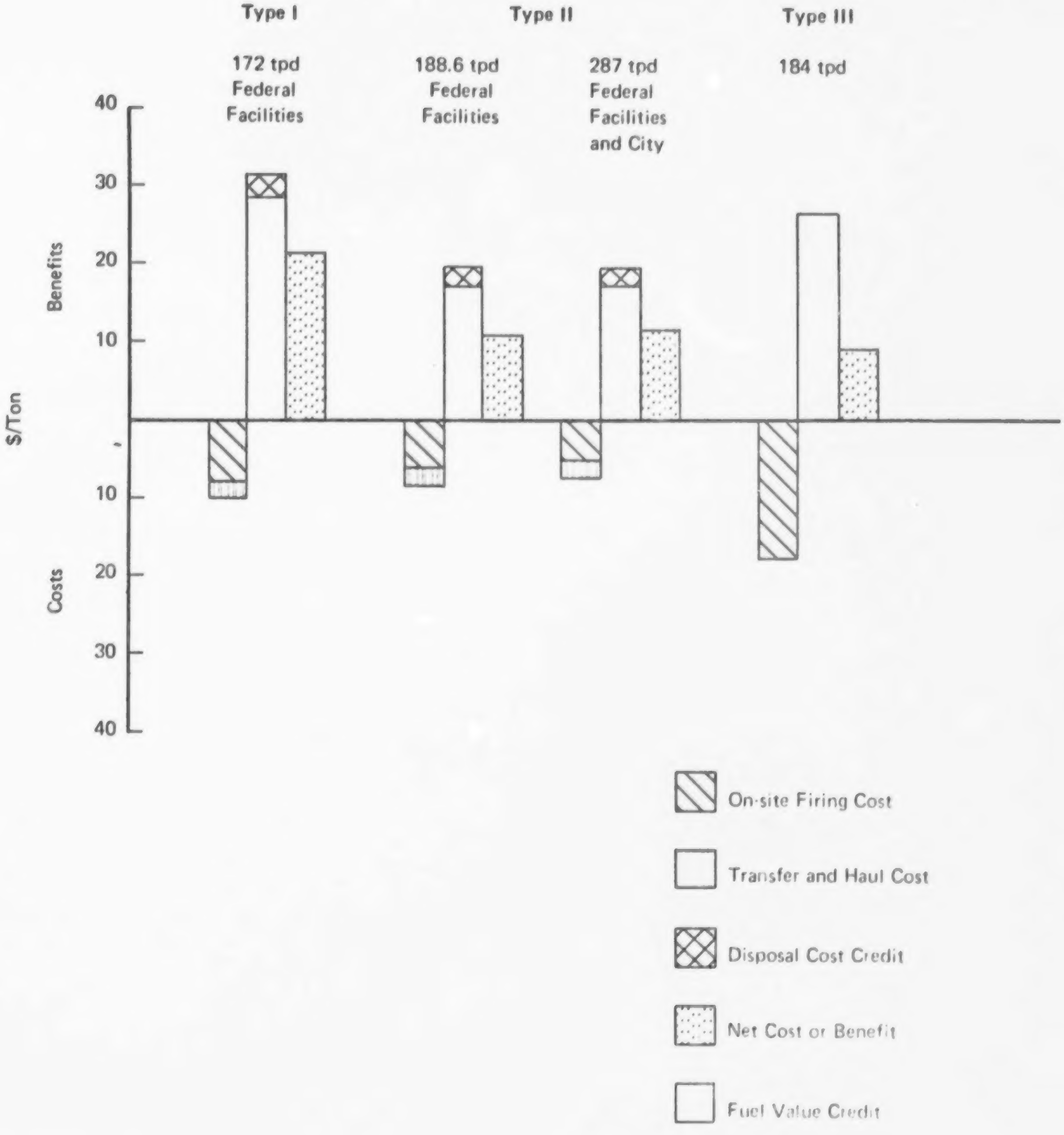
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility				
Fac. and other fed. fac.	1455658	6.32	2.30	8.62
Fac. and city	1587219	5.31	2.05	7.36
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
927708	14.00	3.55	17.55

WEST HEATING PLANT



STATE: District of Columbia

FACILITY Washington Navy Yard

	I	II	III	
	32	53.3	34.3	
Maximum refuse rate at 50% firing				tpd

Available refuse	from facility	10.8	tpd
	from other fed. fac.	188.6	tpd
	from city		tpd
	from county		tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	689252	34.44		34.44
Fac. and other fed. fac.	751241	15.76	4.35	20.11
Fac. and city				
County				

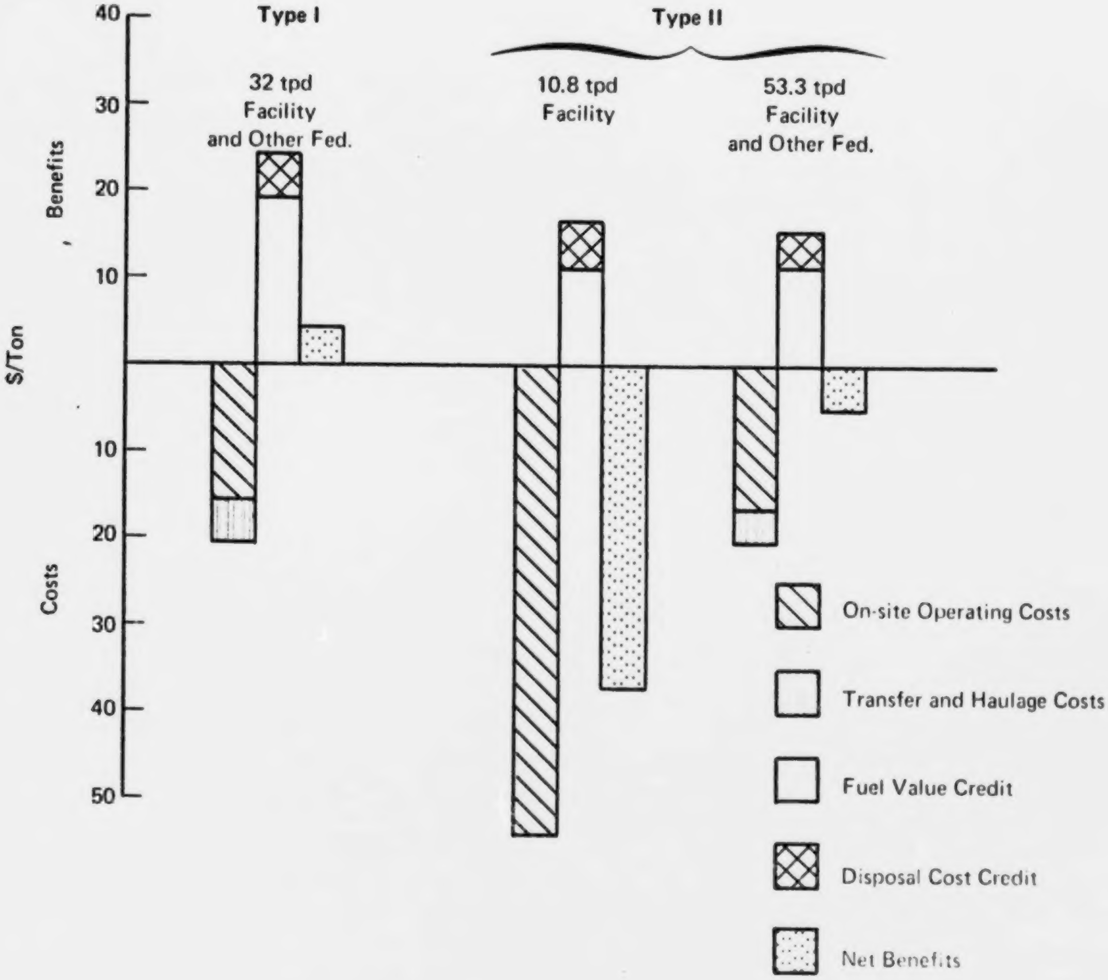
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1130352	54.27		54.27
Fac. and other fed. fac.	1254622	16.75	3.90	20.65
Fac. and city				
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
677266	14.00	14.75	28.75

WASHINGTON NAVY YARD



STATE: IDAHO

FACILITY Mt. Home AFB

	I	II	III	
Maximum refuse rate at 50% firing	42	70	45	____ tpd

Available refuse from facility 30.9 tpd

from other fed. fac. 0.5 tpd

from city ____ tpd

from county 39 tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	808981	17.01		17.01
Fac. and other fed. fac.	810443	16.84	7.50	24.34
Fac. and city				
County	832665	14.78	5.50	20.28

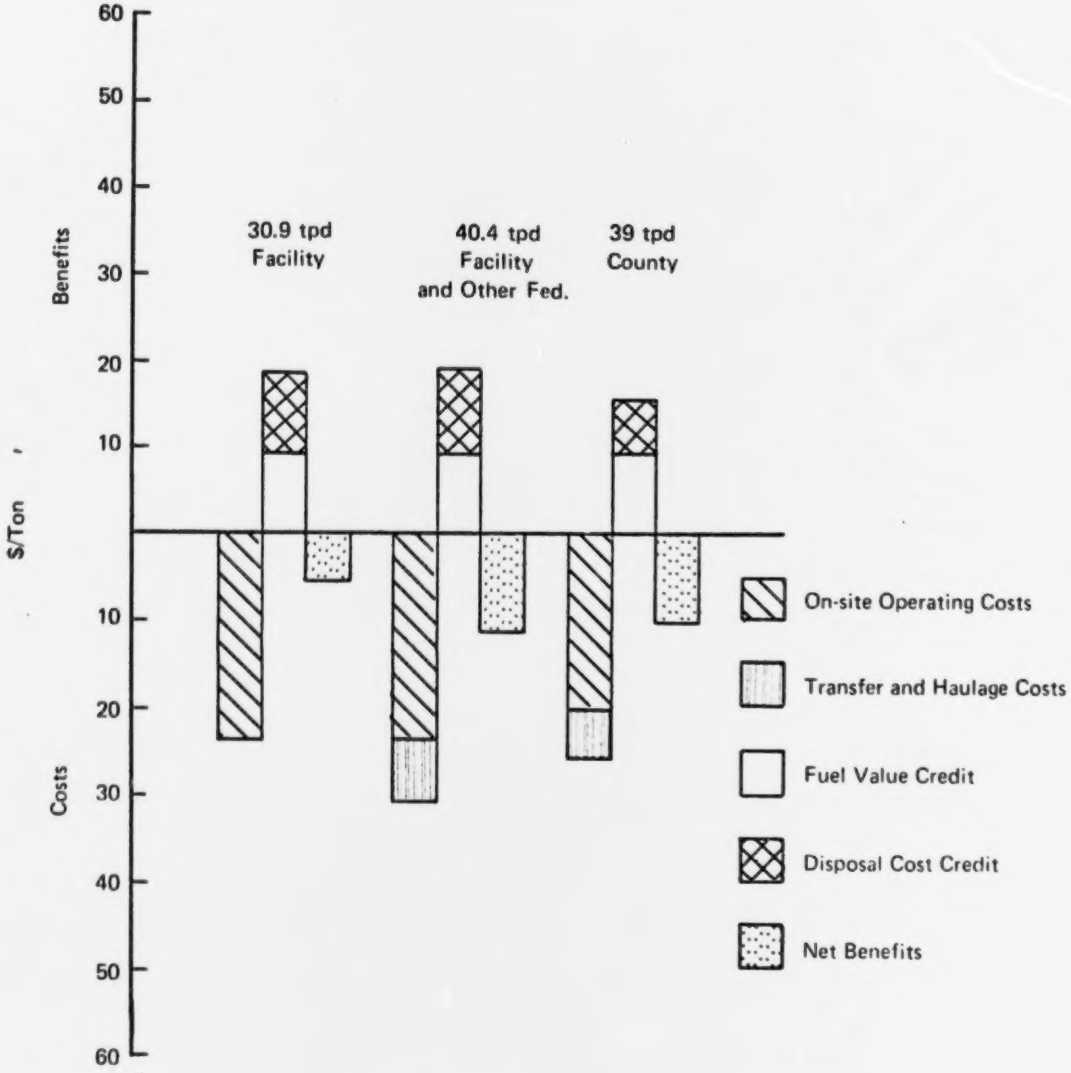
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1250081	23.69		23.69
Fac. and other fed. fac.	1251543	23.41	7.50	30.91
Fac. and city				
County	1273765	20.09	5.50	25.59

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
769509	14.00	15.75	29.75

MOUNTAIN HOME AFB – TYPE II



STATE: ILLINOIS

FACILITY Chanute AFB

	I	II	III	
Maximum refuse rate at 50% firing	36	59.5	38	____ tpd

Available refuse		
	from facility	40.8 tpd
	from other fed. fac.	2.9 tpd
	from city (Rantoul)	57.5 tpd
	from county	____ tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	785767	15.00		15.00
Fac. and other fed. fac.				
Fac. and city				
County				

TYPE II

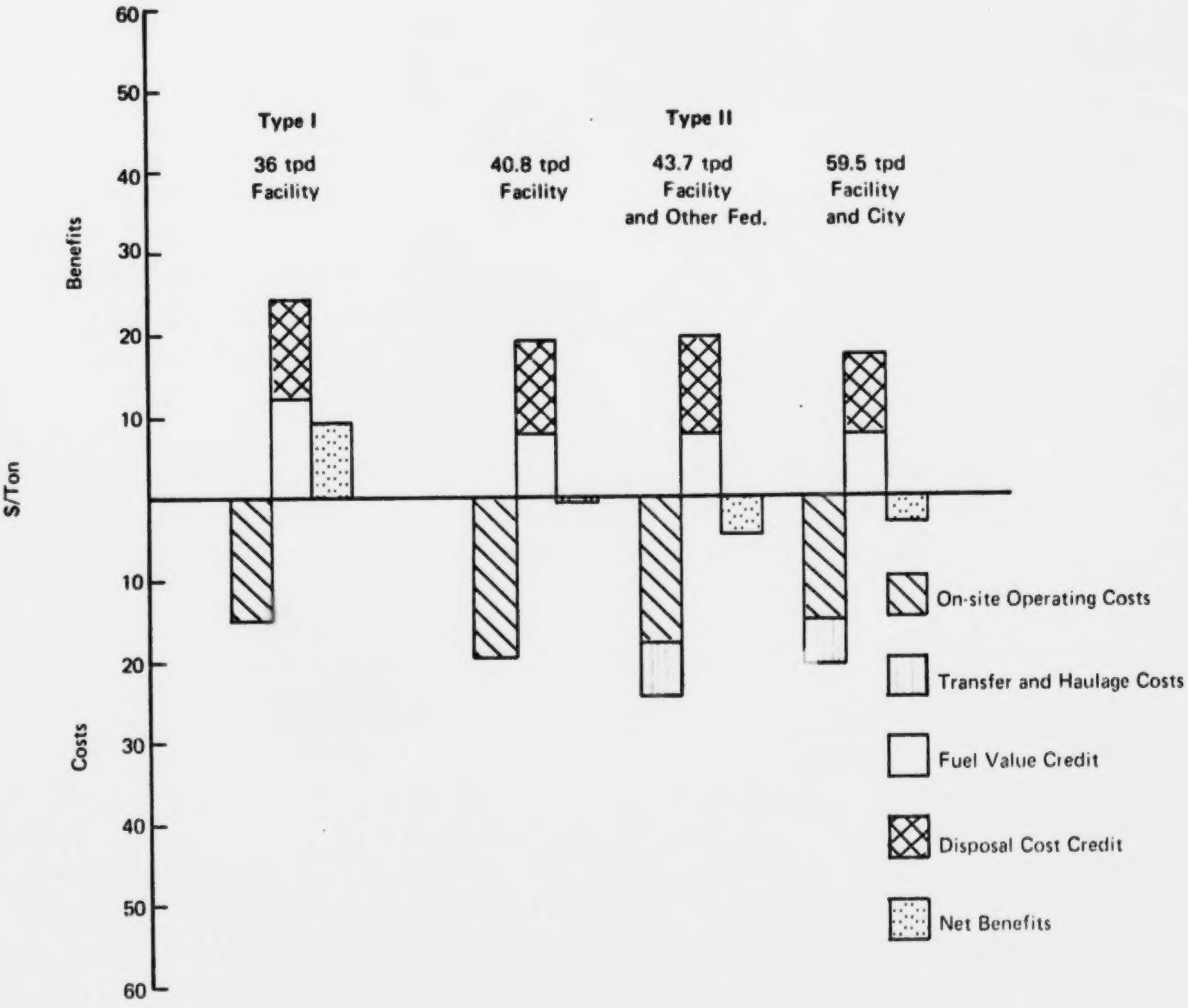
	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1240902	19.54		19.54
Fac. and other fed. fac.	1249381	18.69	5.80	24.49
Fac. and city	1295581	15.54	5.20	20.74
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
710915	14.00	17.43	31.43

ILLINOIS

CHANUTE AFB



STATE: ILLINOIS

FACILITY 928th Tactical Airlife @ O'Hare Field

	I	II	III	
Maximum refuse rate at 50% firing	19	31	20	tpd

Available refuse from facility 3.2 tpd

from other fed. fac. 61 tpd

from city (Chicago) 7885 tpd

from county ______ tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	577526	88.48		88.48
Fac. and other fed. fac.	623725	13.85	3.20	17.05
Fac. and city				
County				

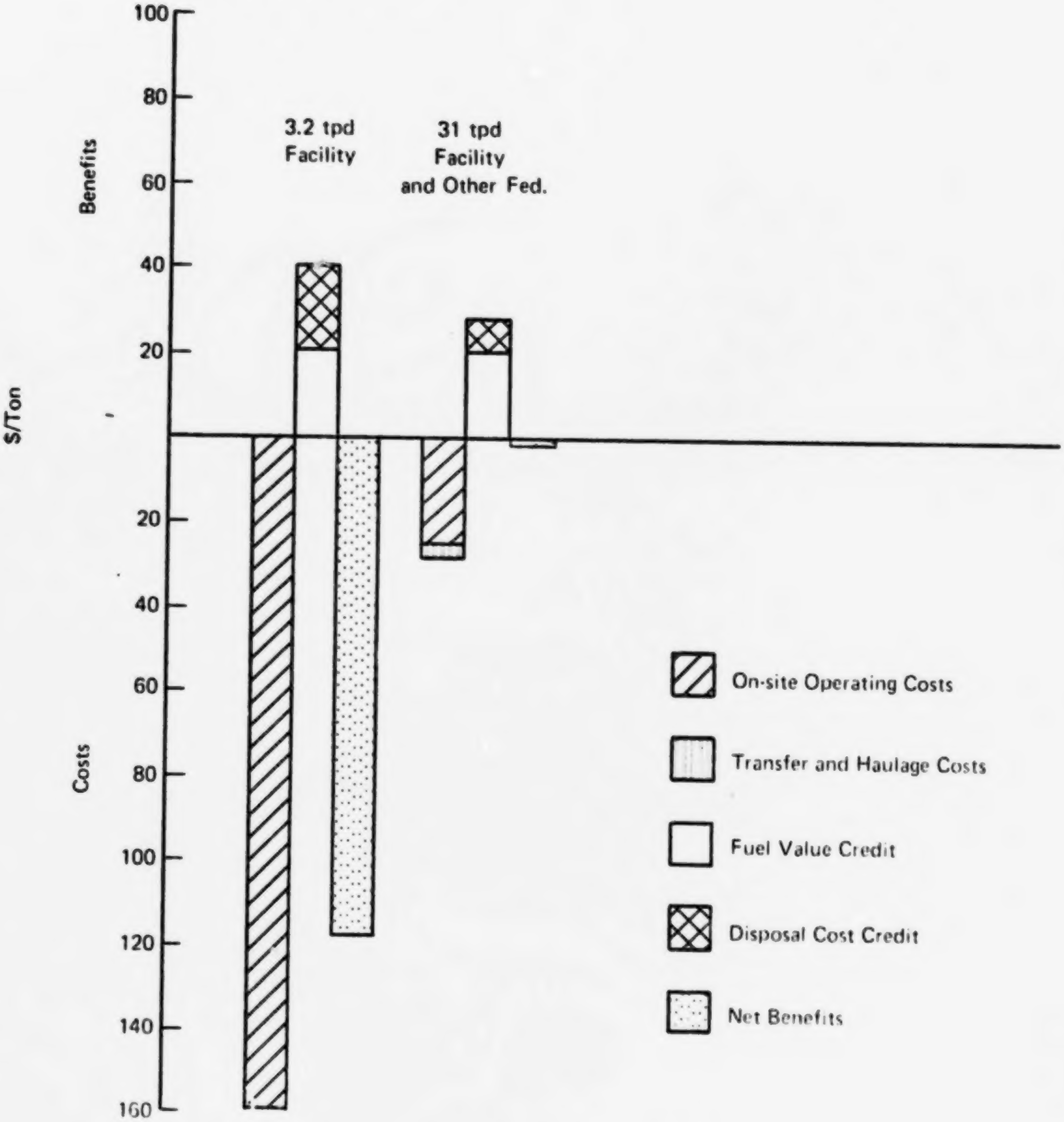
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1018626	159.85		159.85
Fac. and other fed. fac.	1099913	24.94	3.20	28.14
Fac. and city				
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
545949	14.00	26.53	40.53

928TH TACTICAL AIRLIFT AT O'HARE – TYPE II



STATE: ILLINOIS

FACILITY Rock Island Arsenal

	I	II	III	
Maximum refuse rate at 50% firing	64	107	69	tpd

Available refuse from facility 14.3 tpd

from other fed. fac. 7.6 tpd

from city 113 tpd

from county ______ tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	959468	35.93		35.93
Fac. and other fed. fac.	981686	25.73	4.50	30.13
Fac. and city	1104791	12.88	2.80	15.68
County				

TYPE II

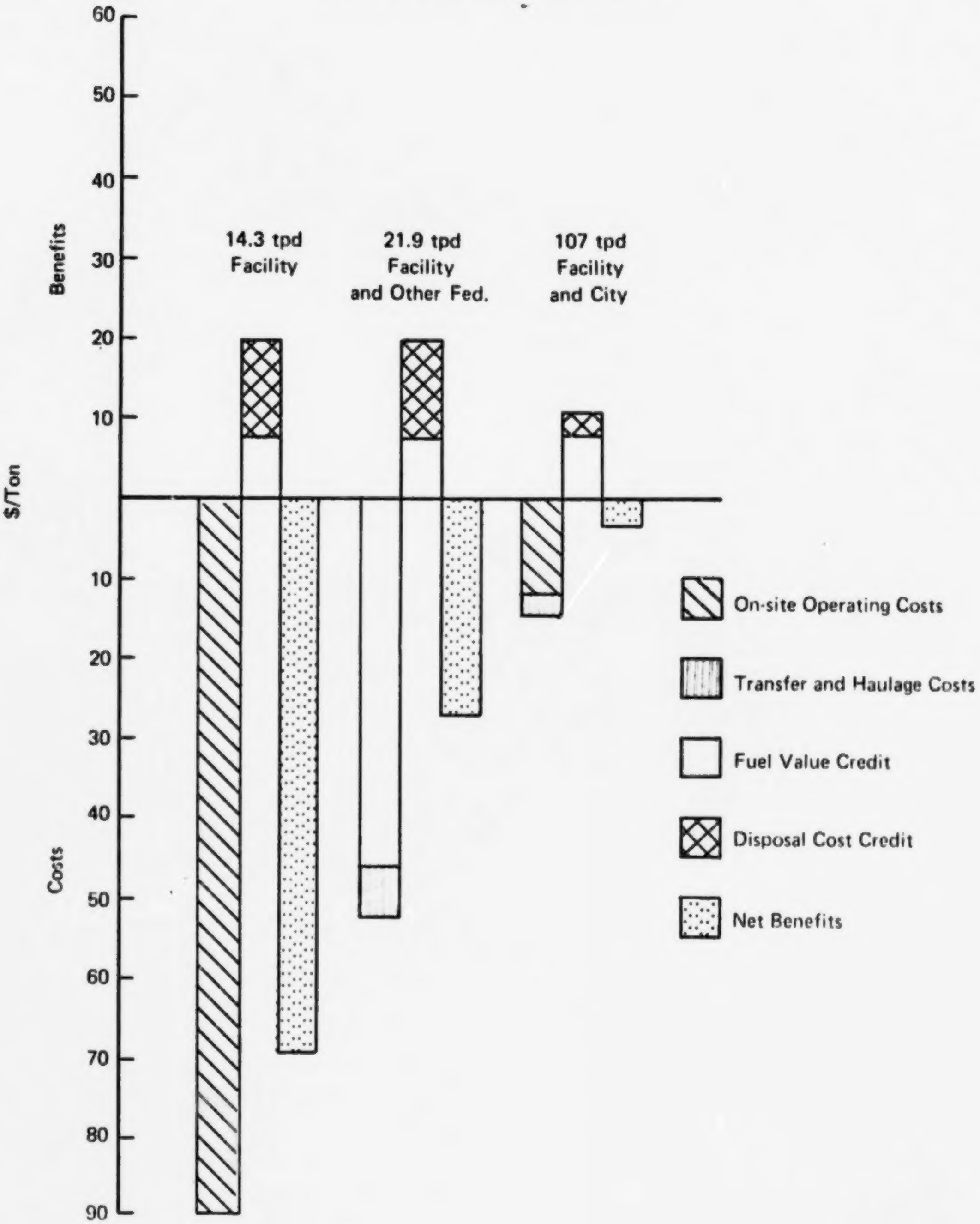
	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1400568	49.30		49.30
Fac. and other fed. fac.	1422791	34.04	4.50	38.54
Fac. and city	1884814	12.05	2.80	14.85
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
1038711	14.00	13.49	27.49

ILLINOIS

ROCK ISLAND ARSENAL – TYPE II



STATE: INDIANA

FACILITY Ft. Benjamin Harrison

		I	II	III	
Maximum refuse rate at 50% firing		18	30	19	tpd

Available refuse	from facility	48	tpd
	from other fed. fac.	17.5	tpd
	from city		tpd
	from county		tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	749340	24.17		24.17
Fac. and other fed. fac.				
Fac. and city				
County				

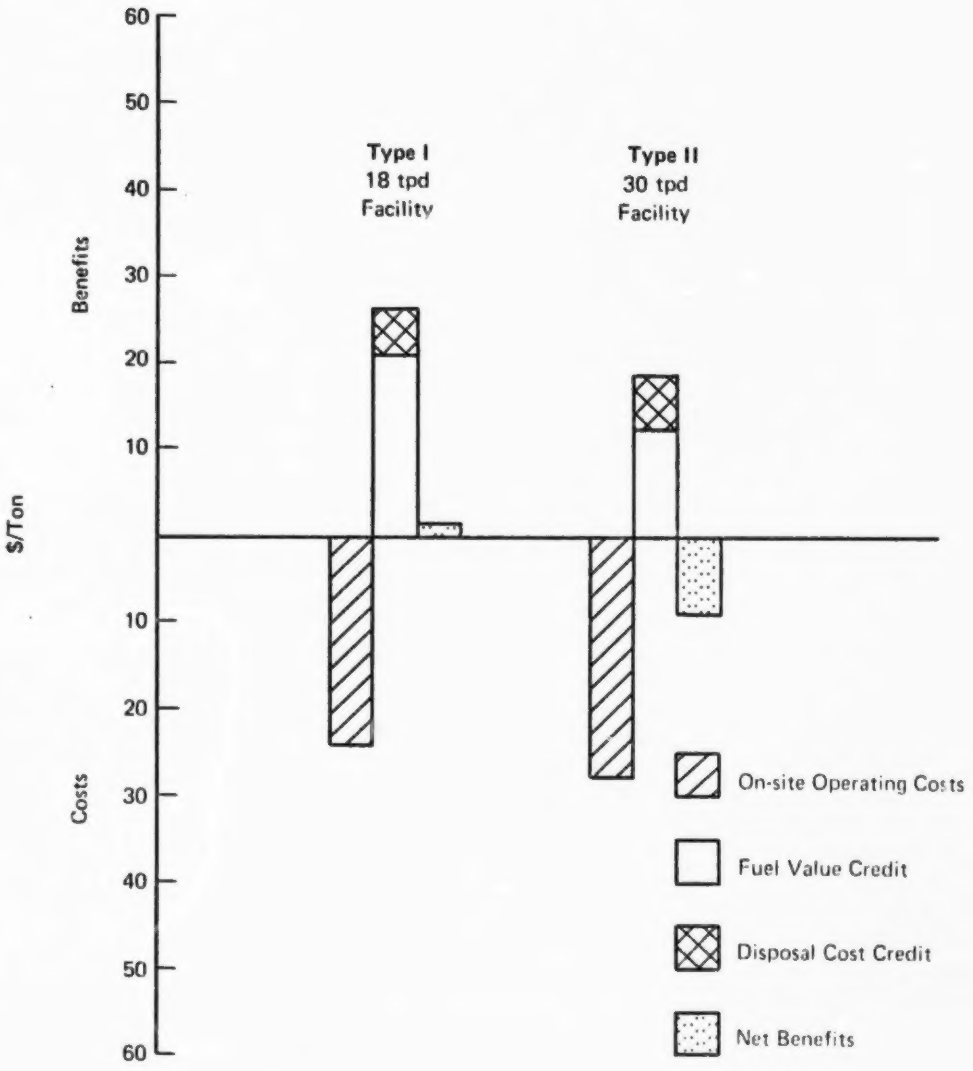
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	12211121	27.41		27.41
Fac. and other fed. fac.				
Fac. and city				
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
671564	14.00	34.09	48.09

FT. BENJAMIN HARRISON



STATE: INDIANA

FACILITY Grisson AFB

	I	II	III	
Maximum refuse rate at 50% firing	21	35.5	23	tpd

Available refuse	from facility	20	tpd
	from other fed. fac.	0.7	tpd
	from city		tpd
	from county (4.6 mi)	24.5	tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	645699	19.85		19.85
Fac. and other fed. fac.	647746	19.39	4.90	24.29
Fac. and city				
County	648623	19.20	4.70	23.90

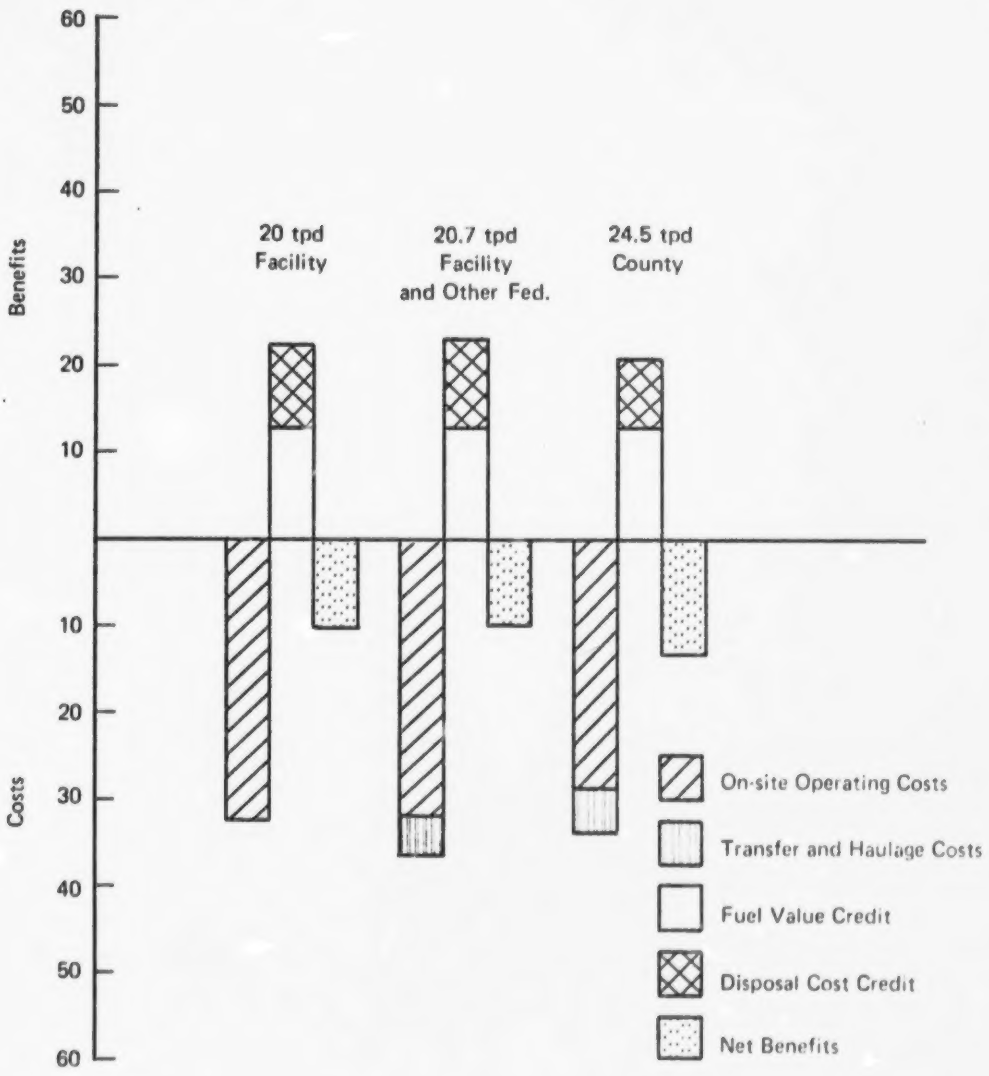
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1086799	23.87		32.81
Fac. and other fed. fac.	1088846	32.06	4.90	36.96
Fac. and city				
County	1089963	28.49	5.40	33.89

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
573771	14.00	24.03	38.03

GRISSOM AFB – TYPE II



STATE: IOWA

FACILITY Iowa Army Ammunition Plant

	I	II	III	
Maximum refuse rate at 50% firing	53	88	56.5	tpd

Available refuse from facility 1.7 tpd
from other fed. fac. 0.3 tpd
from city 73 tpd
from county tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	521703	147.07		147.07
Fac. and other fed. fac.	522280	94.25	1.00	95.25
Fac. and city	628429	9.45	4.25	13.70
County				

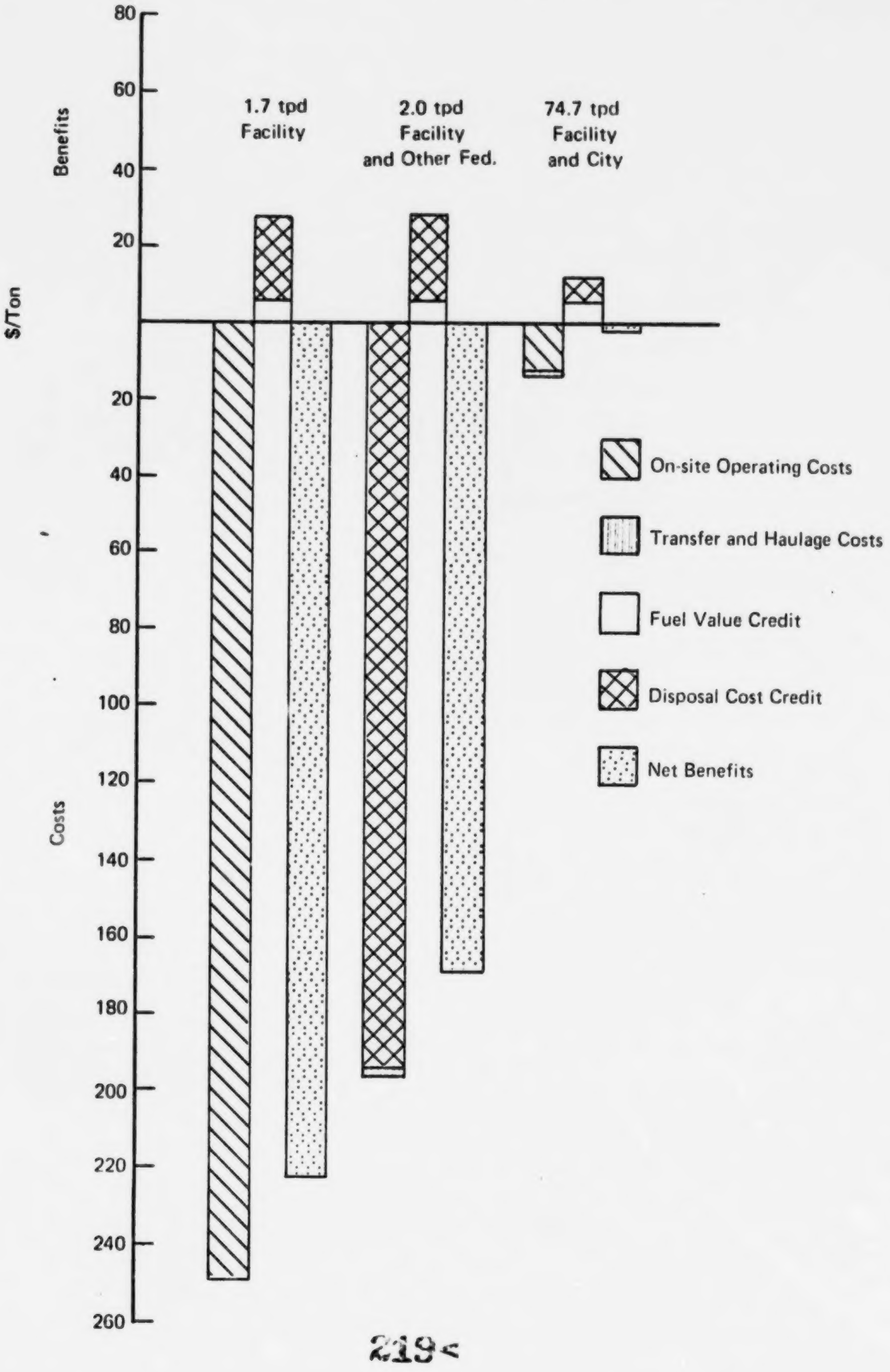
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	962803	249.57		249.57
Fac. and other fed. fac.	963680	195.67	1.00	196.67
Fac. and city	1176255	11.91	1.00	12.91
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
163906	14.00	7.31	21.31

IOWA ARMY AMMUNITION PLANT



STATE: MAINE

FACILITY Loring AFB

	I	II	III	
Maximum refuse rate at 50% firing	52	88	565	______ tpd

Available refuse	from facility	28.1	tpd
	from other fed. fac.	1.2	tpd
	from city (Limestone)	4.3	tpd
	from county (30 mi)	211	tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	387605	12.51		12.51
Fac. and other fed. fac.	391114	12.26	7.50	19.76
Fac. and city	400471	11.68	5.00	16.68
County	540805	9.63	4.70	14.33

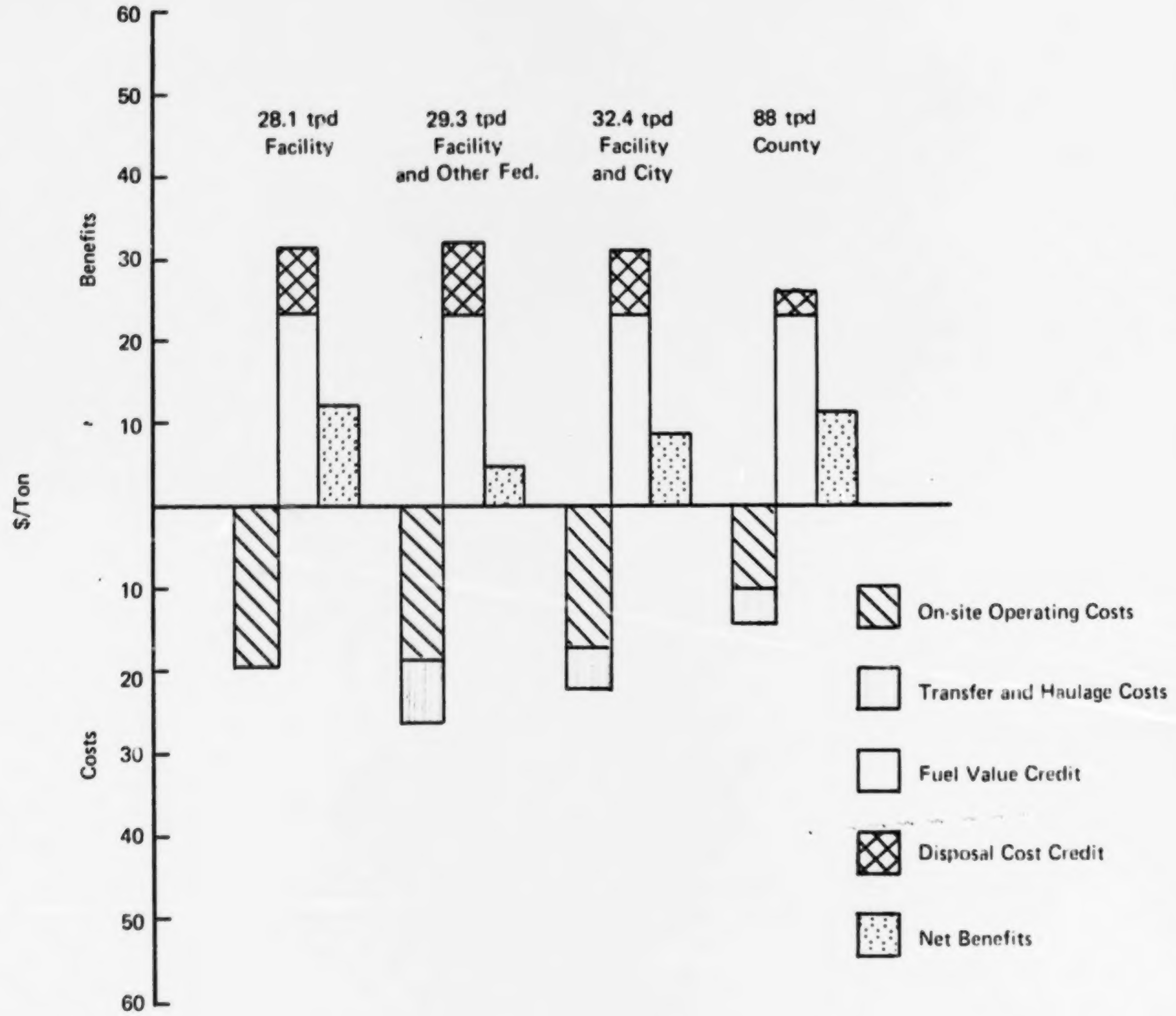
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	902664	19.27		19.27
Fac. and other fed. fac.	906173	18.71	7.50	26.21
Fac. and city	915238	17.47	4.75	22.22
County	1077812	10.06	4.25	14.31

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
862985	14.00	13.84	27.84

LORING AFB – TYPE II



STATE: MASSACHUSETTS

FACILITY Otis AFB

	I	II	III	
Maximum refuse rate at 50% firing	25	41.5	27	tpd

Available refuse	from facility	31.1	tpd
	from other fed. fac.	1.8	tpd
	from city (Falmouth)	8.5	tpd
	from county (Barnstable 6 mi)	216.5	tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	685191	17.59	17.59	
Fac. and other fed. fac.				
Fac. and city				
County				

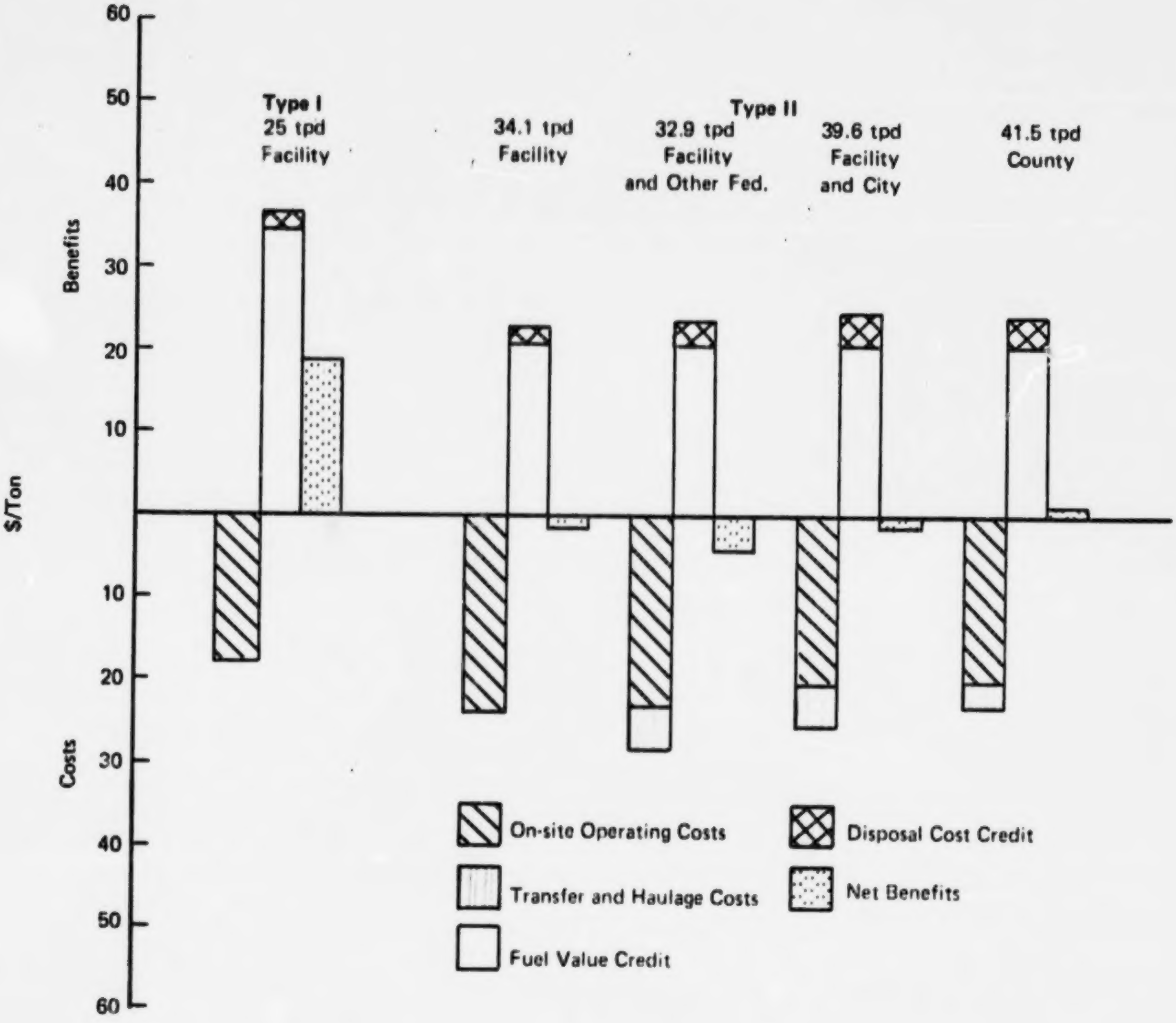
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1144127	23.94		23.94
Fac. and other fed. fac.	1149390	23.07	5.00	28.07
Fac. and city	1151360	20.57	5.75	26.32
County	1174537	20.00	3.50	23.50

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
610339	14.00	2.155	35.55

OTIS AFB


60
50
40
30
20
10
10
20
30
40
50
60
Benefits
$/Ton
Costs
Type I
25 tpd
Facility
Type II
34.1 tpd
Facility
32.9 tpd
Facility
and Other Fed.
39.6 tpd
Facility
and City
41.5 tpd
County
On-site Operating Costs
Transfer and Haulage Costs
Fuel Value Credit
Disposal Cost Credit
Net Benefits

STATE: MICHIGAN

FACILITY Detroit Tank Plant

	I	II	III	
Maximum refuse rate at 50% firing	48	80	51.5	________tpd

Available refuse from facility 3.8 tpd

from other fed. fac. 17.7 tpd

from city (Detroit) 3584 tpd

from county ________ tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	763123	97.83		97.83
Fac. and other fed. fac.	814878	22.44	4.05	26.49
Fac. and city	892364	13.50	3.30	16.80
County				

TYPE II

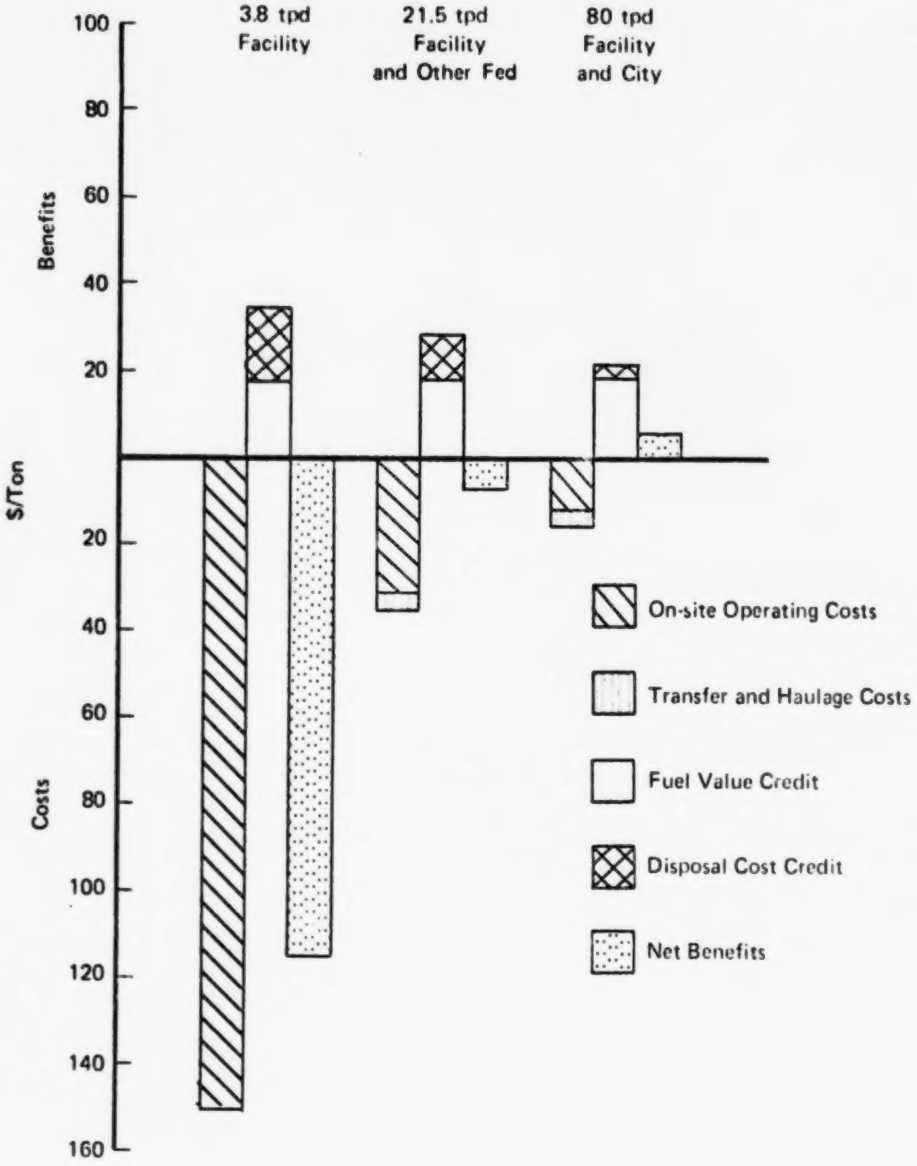
	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1204223	151.26		151.26
Fac. and other fed. fac.	1255978	31.64	4.05	35.69
Fac. and city	1427032	12.87	3.05	15.92
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
821898	14.00	15.56	28.56

MICHIGAN

DETROIT TANK PLANT – TYPE II



STATE: MICHIGAN

FACILITY Kincheloe AFB

	I	II	III	
Maximum refuse rate at 50% firing	59	98	63	________ tpd

Available refuse	from facility	25.7	tpd
	from other fed. fac.	1	tpd
	from city		tpd
	from county	72.6	tpd

TYPE I

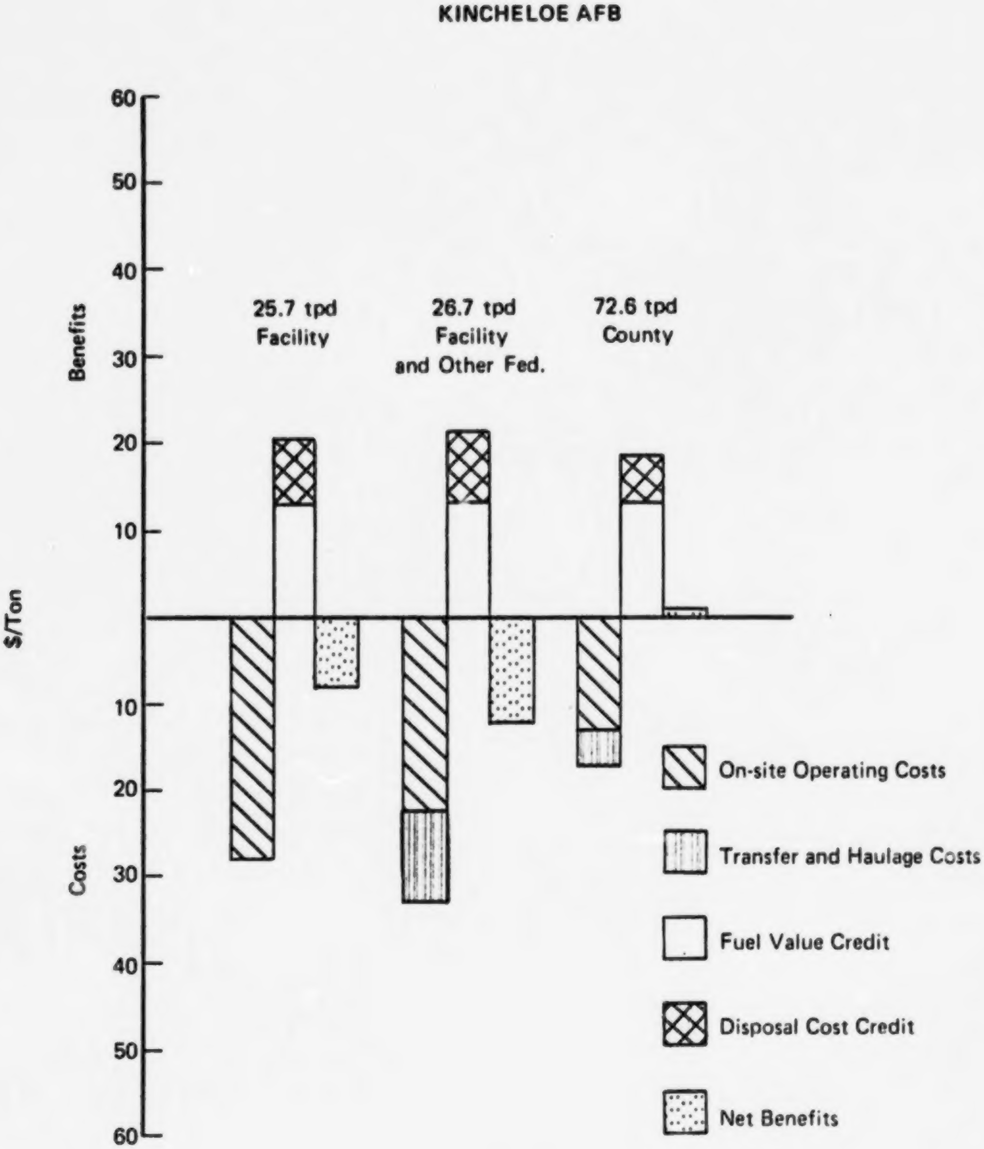
	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	885078	20.83		20.83
Fac. and other fed. fac.	888002	14.04	6.25	20.29
Fac. and city				
County	916073	11.41	4.75	16.16

TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1326178	28.03		28.03
Fac. and other fed. fac.	1329102	27.19	6.25	33.44
Fac. and city				
County	1463313	13.49	3.75	16.24

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
913443	14.00	13.03	27.03


KINCHELOE AFB
60
50
40
30
20
10
10
20
30
40
50
60
Benefits
Costs
$/Ton
25.7 tpd
Facility
26.7 tpd
Facility
and Other Fed.
72.6 tpd
County
On-site Operating Costs
Transfer and Haulage Costs
Fuel Value Credit
Disposal Cost Credit
Net Benefits

STATE: MICHIGAN

FACILITY K I Sawyer AFB

	I	II	III	
Maximum refuse rate at 50% firing	14.5	24	16.5	tpd

Available refuse from facility 25 tpd

from other fed. fac. 0.8 tpd

from city ____ tpd

from county ____ tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	421798	18.38		18.38
Fac. and other fed. fac.				
Fac. and city				
County				

TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	890676	27.56		27.56
Fac. and other fed. fac.				
Fac. and city				
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
382946	14.00	21.24	35.24

STATE: MICHIGAN

FACILITY K I Sawyer AFB

	I	II	III	
Maximum refuse rate at 50% firing	14.5	24	16.5	tpd

Available refuse	from facility	25	tpd
	from other fed. fac.	0.8	tpd
	from city		tpd
	from county		tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	421798	18.38		18.38
Fac. and other fed. fac.				
Fac. and city				
County				

TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	890676	27.56		27.56
Fac. and other fed. fac.				
Fac. and city				
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
382946	14.00	21.24	35.24

STATE: NORTH CAROLINA

FACILITY Camp Lejeune

	I	II	III	
Maximum refuse rate at 50% firing	106	177	114	tpd

Available refuse from facility 175 tpd

from other fed. fac. 3.1 tpd

from city 50.4 tpd

from county tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	918164	8.90		8.90
Fac. and other fed. fac.				
Fac. and city				
County				

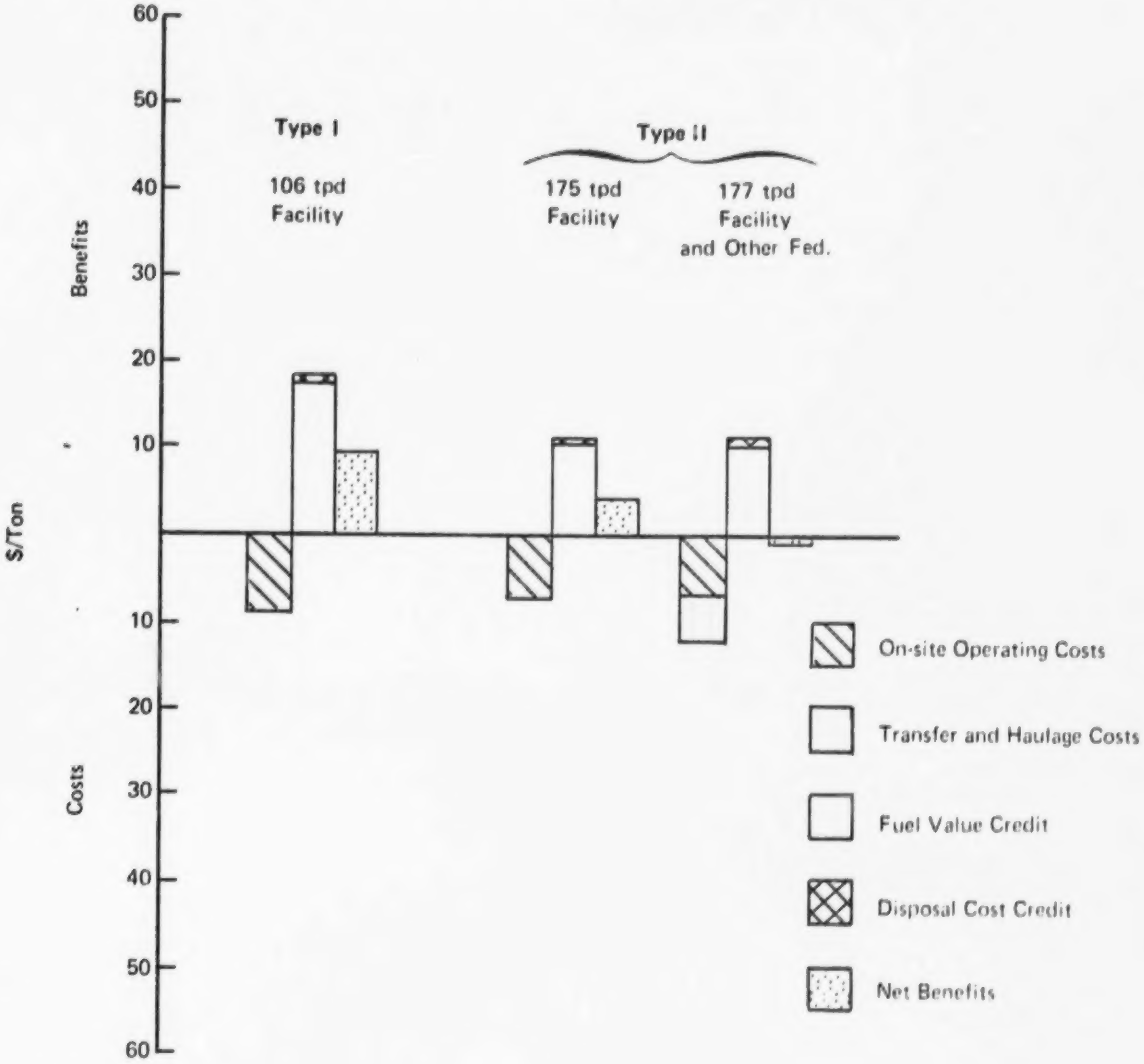
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1451517	7.02		7.02
Fac. and other fed. fac.	1454191	6.98	5.50	12.48
Fac. and city	1454191	6.98	5.50	12.48
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
1496249	14.00	11.05	22.05

CAMP LEJEUNE



STATE: OHIO

FACILITY Defense Electric Supply Center

		I	II	III	
Maximum refuse rate at 50% firing		30	50	32	tpd
Available refuse	from facility	3.5			tpd
	from other fed. fac.	24.6			tpd
	from city (Dayton)	545			tpd
	from county				tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	655272	91.57		91.57
Fac. and other fed. fac.	7272024	16.88	4.00	20.88
Fac. and city	732758	16.20	4.00	20.20
County				

TYPE II

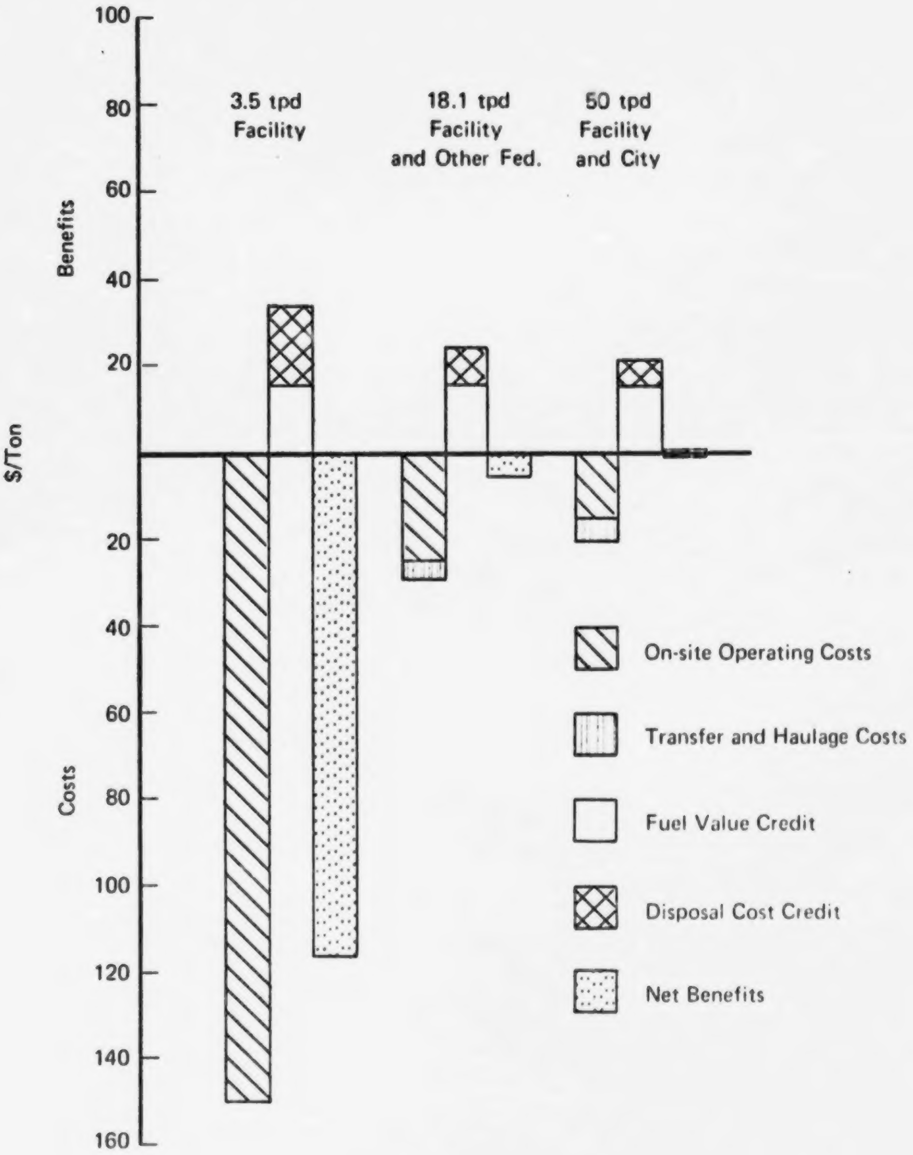
	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1096372	150.50		150.50
Fac. and other fed. fac.	1168302	25.33	4.00	29.33
Fac. and city	1232338	17.50	3.70	21.20
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
987936	14.00	28.92	42.92

OHIO

DEFENSE ELECTRIC SUPPLY CENTER – TYPE II



STATE: OHIO

FACILITY Rickenbacker AFB

	I	II	III	
Maximum refuse rate at 50% firing	58	97	62.5	tpd

Available refuse from facility 90.2 tpd

from other fed. fac. 11.7 tpd

from city 1208 tpd

from county tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	976419	12.69		12.69
Fac. and other fed. fac.				
Fac. and city				
County				

TYPE II

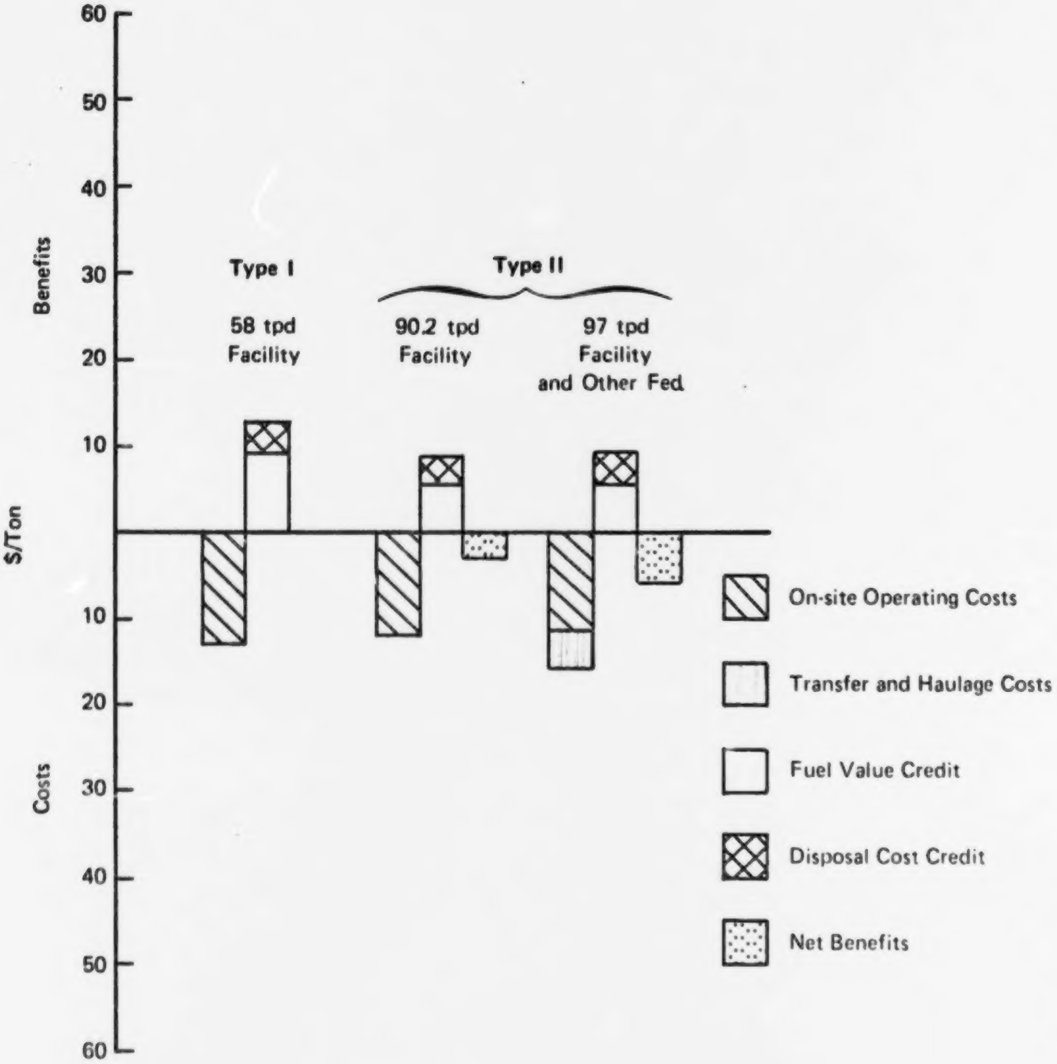
	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1511672	11.94		11.94
Fac. and other fed. fac.	1531555	11.49	4.25	15.74
Fac. and city				
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
908877	14.00	13.08	27.08

OHIO

RICKENBACKER AFB



STATE: OHIO

FACILITY Wright-Patterson AFB

	I	II	III		
Maximum refuse rate at 50% firing	86.5	144	92.5		tpd

Available refuse	from facility	151	tpd
	from other fed. fac.	24.6	tpd
	from city (Dayton)	54.5	tpd
	from county		tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1201248	11.32		11.32
Fac. and other fed. fac.				
Fac. and city				
County				

TYPE II

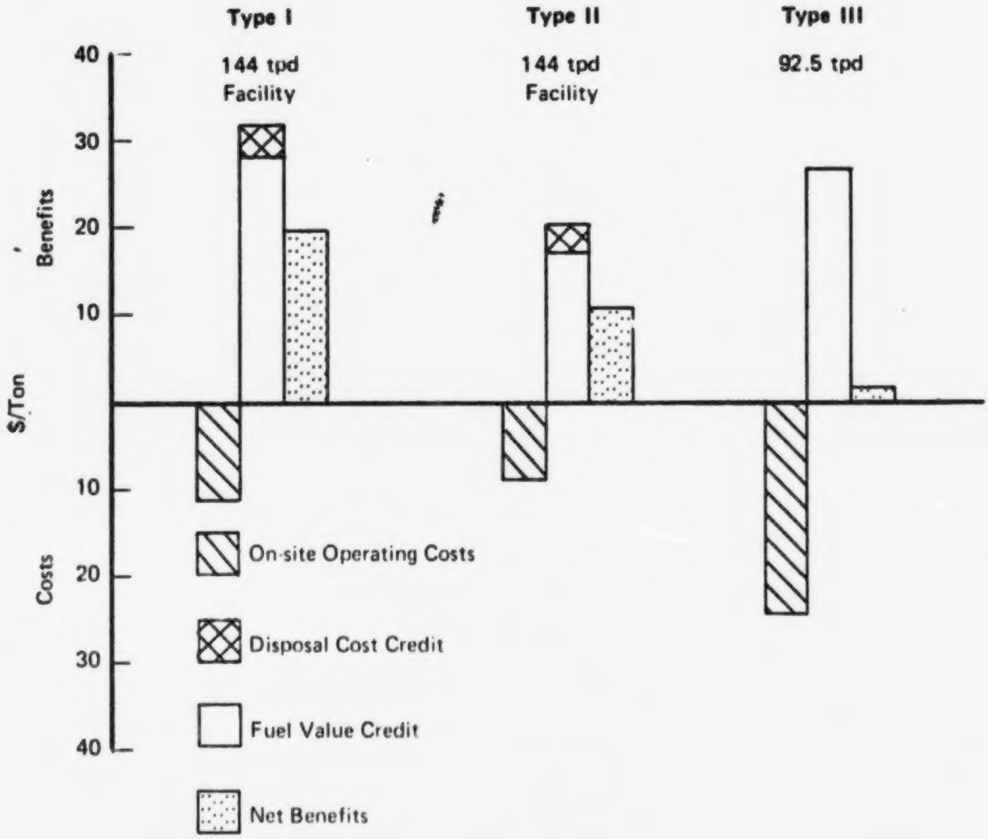
	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1964950	9.74		9.74
Fac. and other fed. fac.				
Fac. and city				
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
1164838	14.00	11.03	25.03

OHIO

WRIGHT-PATTERSON AFB



STATE: OREGON

FACILITY Kingsley Field

	I	II	III	
Maximum refuse rate at 50% firing	7	12	8	tpd

Available refuse from facility 6.9 tpd

from other fed. fac. 0.8 tpd

from city (Klamath Falls) 37 tpd

from county tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	524605	40.12		40.12
Fac. and other fed. fac.	524897	39.60	7.50	47.10
Fac. and city				
County				

TYPE II

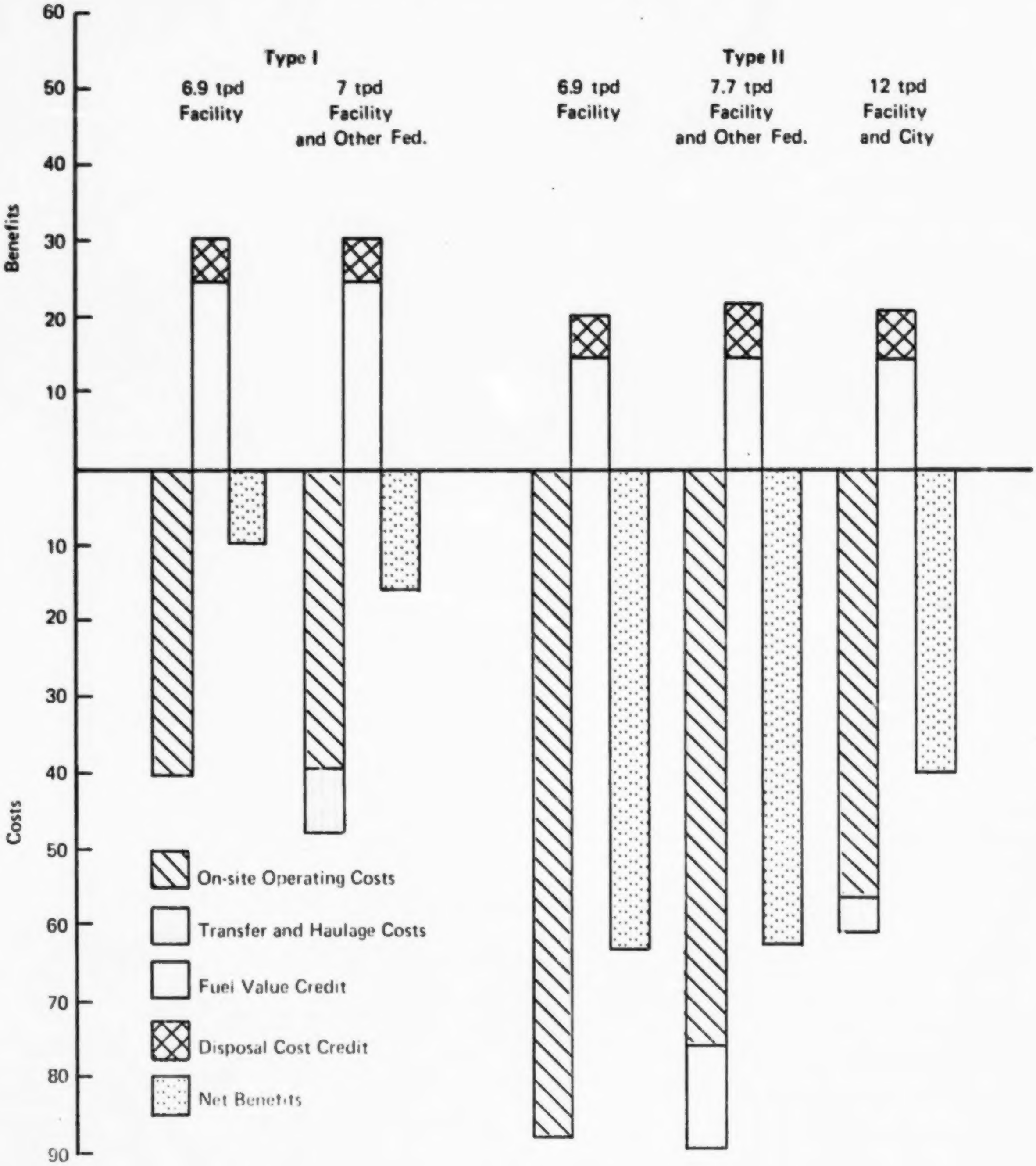
	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	965705	83.40		83.40
Fac. and other fed. fac.	968044	76.81	7.50	84.31
Fac. and city	980617	54.44	4.80	61.24
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
447121	14.00	56.58	70.58

OREGON

KINGSLEY FIELD



STATE: PENNSYLVANIA

FACILITY Tobyhanna Army Depot

	I	II	III		
Maximum refuse rate at 50% firing	32	53	34		tpd

Available refuse from facility 40 tpd

from other fed. fac. 3.6 tpd

from city (Tobyhanna) 2 tpd

from county ____ tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	936822	18.44		18.44
Fac. and other fed. fac.				
Fac. and city				
County				

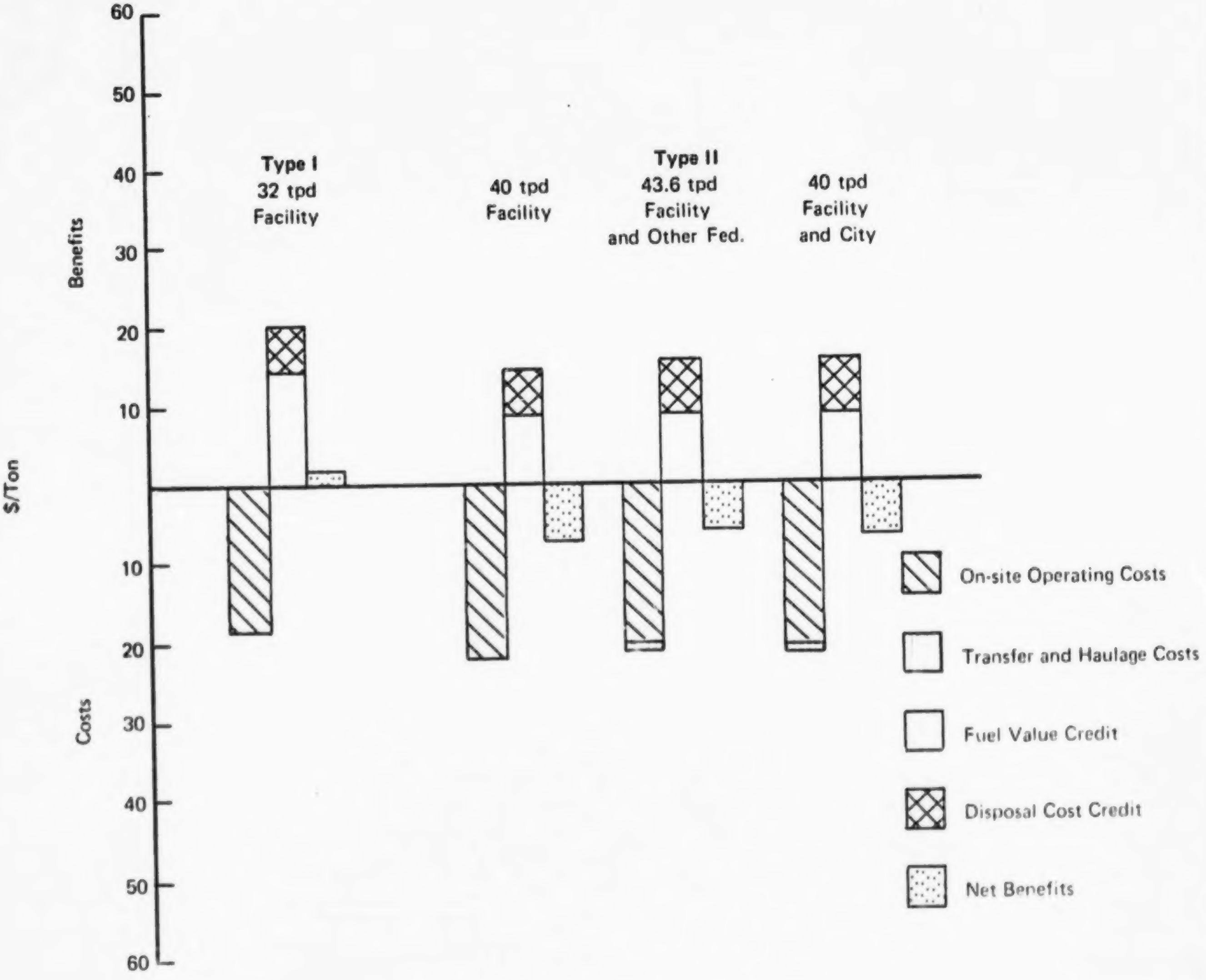
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1401314	22.08		22.08
Fac. and other fed. fac.	1411840	20.85	1.00	21.85
Fac. and city	1406162	21.37	1.00	22.37
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
861970	14.00	23.72	32.72

TOBYHANNA ARMY DEPOT



STATE: SOUTH CAROLINA

FACILITY Savannah River

	I	II	III	
Maximum refuse rate at 50% firing	657	1095	704	tpd

Available refuse from facility 1.3 tpd

from other fed. fac. 0.4 tpd

from city tpd

from county (Aiken) 204 tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	396944	35.58		35.58
Fac. and other fed. fac.	398114	28.68	5.70	34.58
Fac. and city				
County	898774	8.98	3.50	12.48

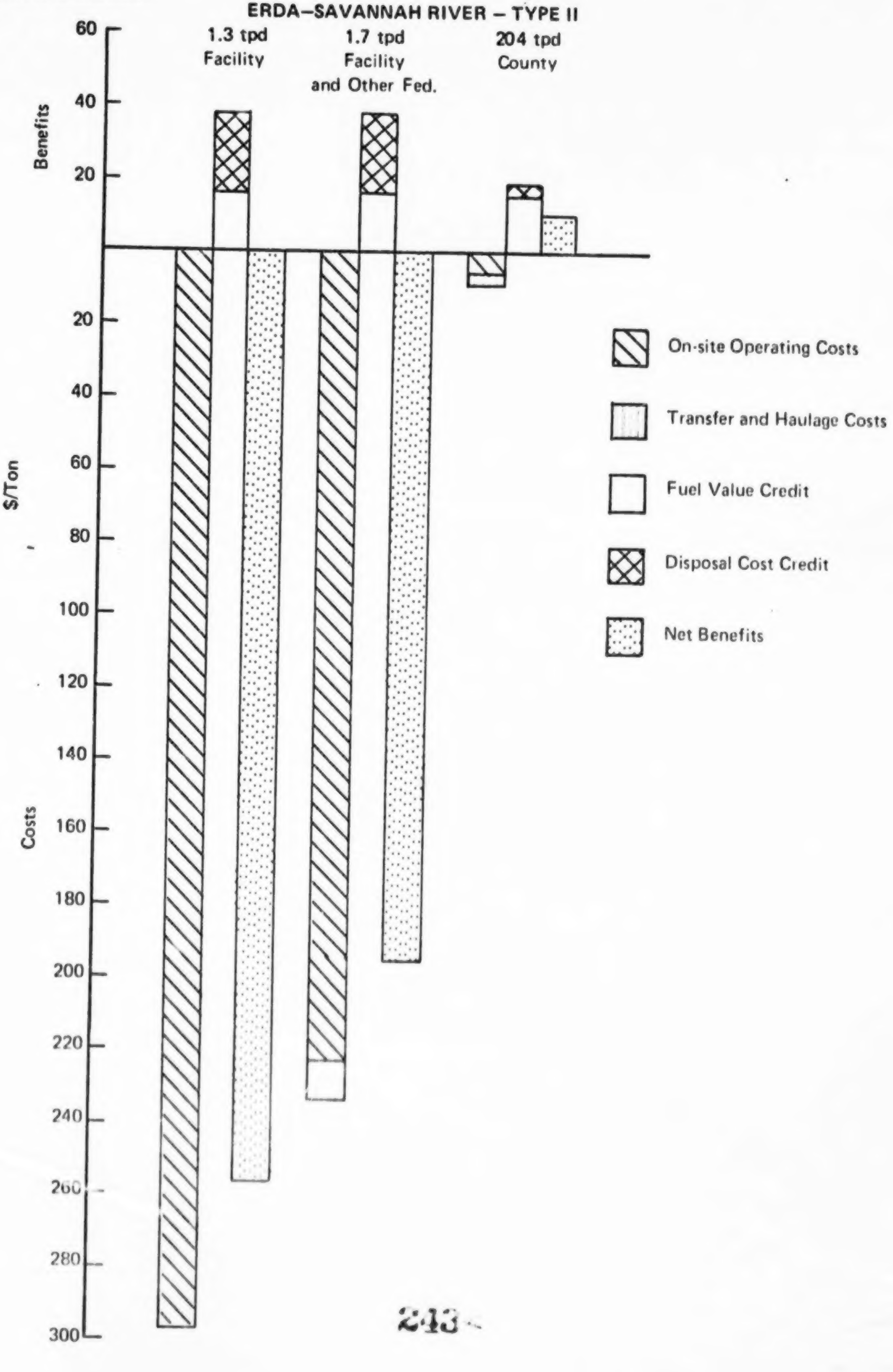
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	824301	295.99		295.99
Fac. and other fed. fac.	825471	227.22	5.70	232.92
Fac. and city				
County	1477986	5.57	2.70	8.27

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
1768648	14.00	1.63	15.63

SOUTH CAROLINA



STATE: TENNESSEE

FACILITY Holston AAP

	I	II	III		
Maximum refuse rate at 50% firing	255	425.5	273.5		tpd

Available refuse from facility 1.8 tpd

from other fed. fac. 0.5 tpd

from city 76 tpd

from county ________ tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1052743	275.38		833.59
Fac. and other fed. fac.	1054205	216.87	1.00	217.87
Fac. and city				
County				

TYPE II

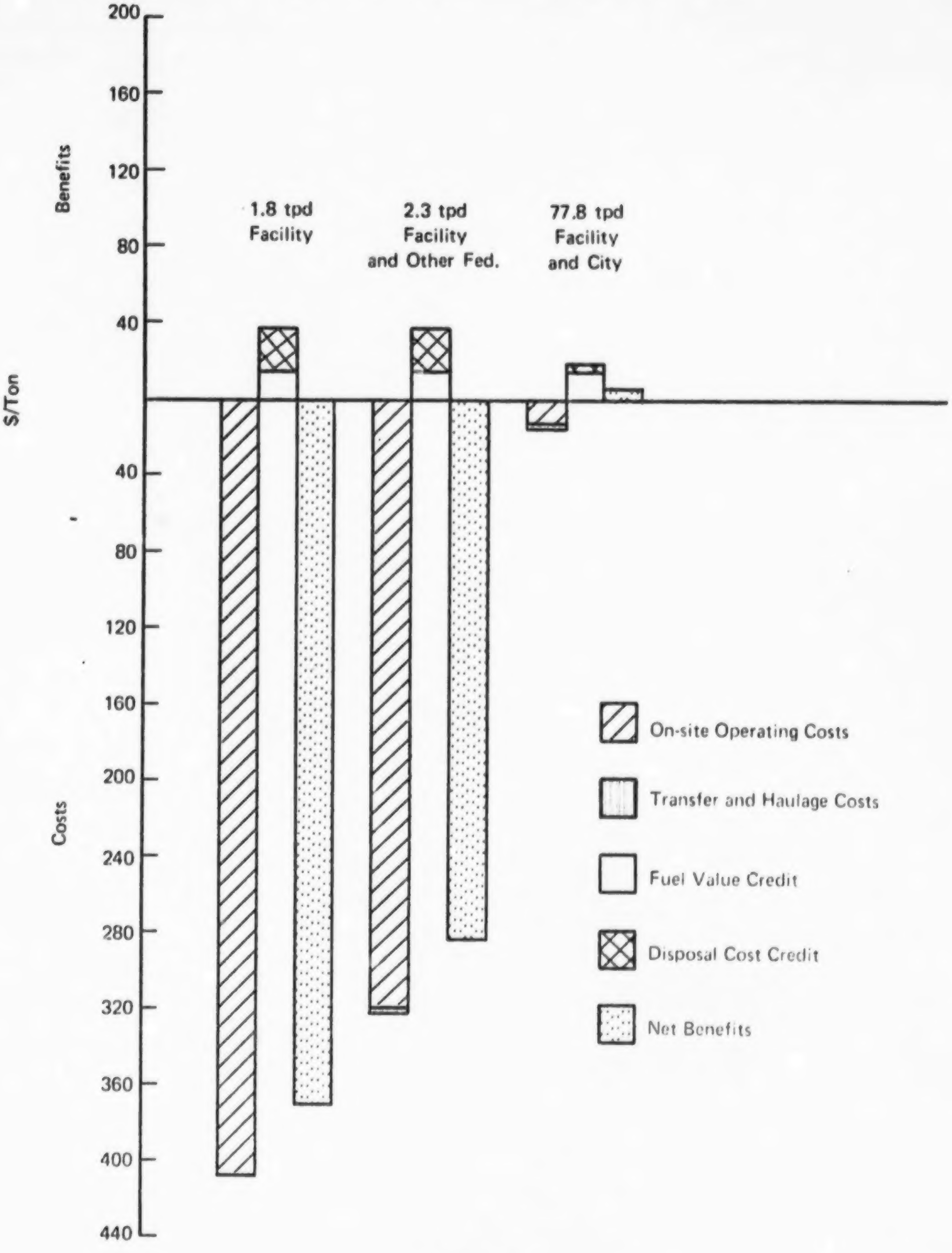
	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1580776	408.70		408.70
Fac. and other fed. fac.	1582238	320.78	1.00	321.78
Fac. and city	1803000	13.33	1.00	14.33
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
1848301	14.00	5.73	19.23

TENNESSEE

HOLSTON ARMY AMMUNITION PLANT – TYPE II



STATE: TENNESSEE

FACILITY Oakridge National Lab.

	I	II	III	
Maximum refuse rate at 50% firing	515	858	552	tpd

Available refuse from facility 14 tpd

from other fed. fac. 1.4 tpd

from city 63.5 tpd

from county ______ tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	2480353	86.75		86.75
Fac. and other fed. fac.	2484447	79.43	4.50	83.93
Fac. and city	2573190	14.54	3.20	17.74
County				

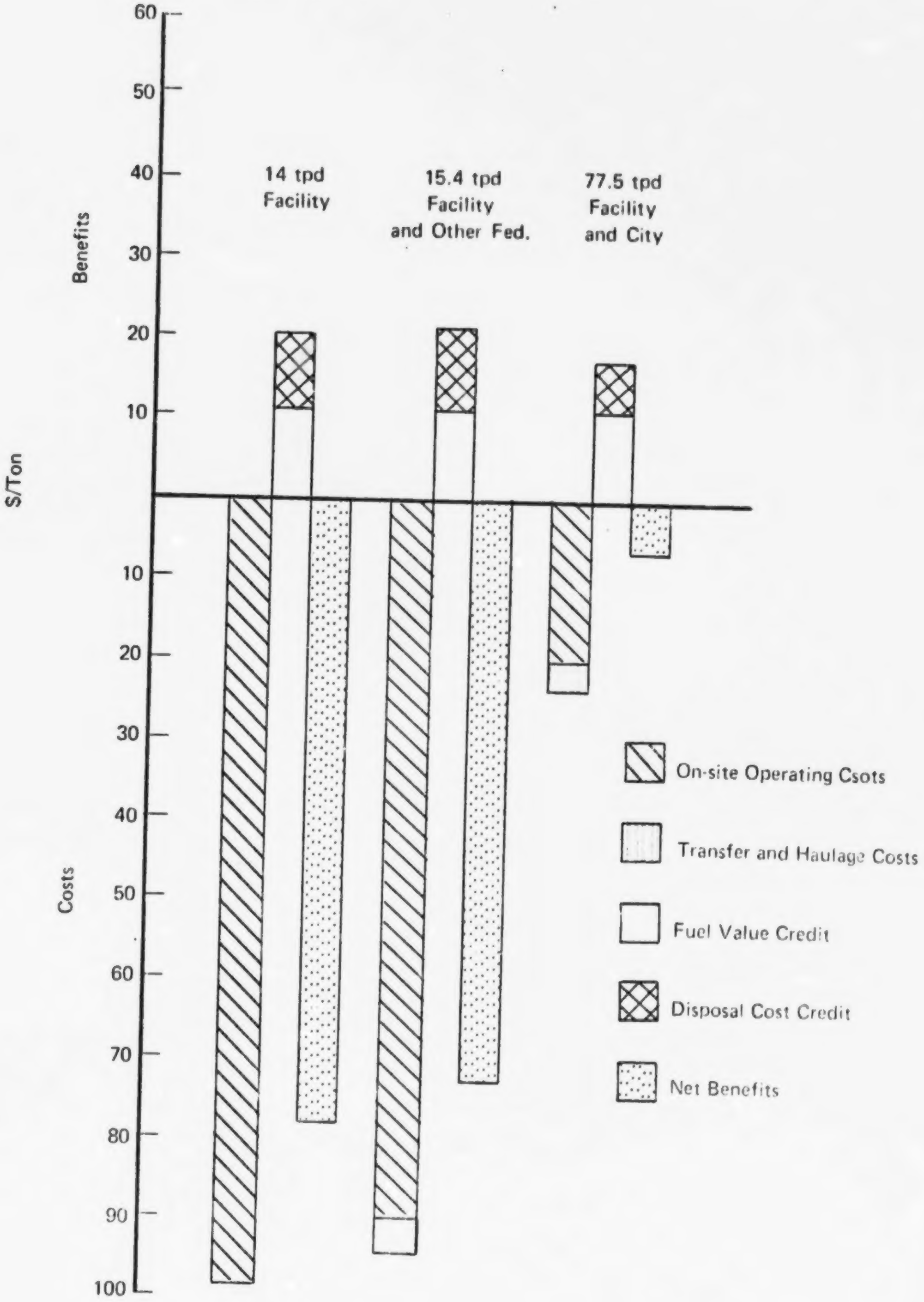
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	2921453	98.80		98.80
Fac. and other fed. fac.	2925547	90.16	4.50	94.66
Fac. and city	3107127	20.90	3.20	24.10
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
3625441	14.00	5.31	19.31

ERDA – OAKRIDGE NATIONAL LAB – TYPE II



STATE: VIRGINIA

FACILITY Marine Corp Dev. and Ed. Comm.

	I	II	III	
Maximum refuse rate at 50% firing	52	87	56	tpd

Available refuse	from facility	(10-100)	tpd
	from other fed. fac.	2.2	tpd
	from city (Quantic)	2.2	tpd
	from county		tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1017006	13.95		13.95
Fac. and other fed. fac.				
Fac. and city				
County				

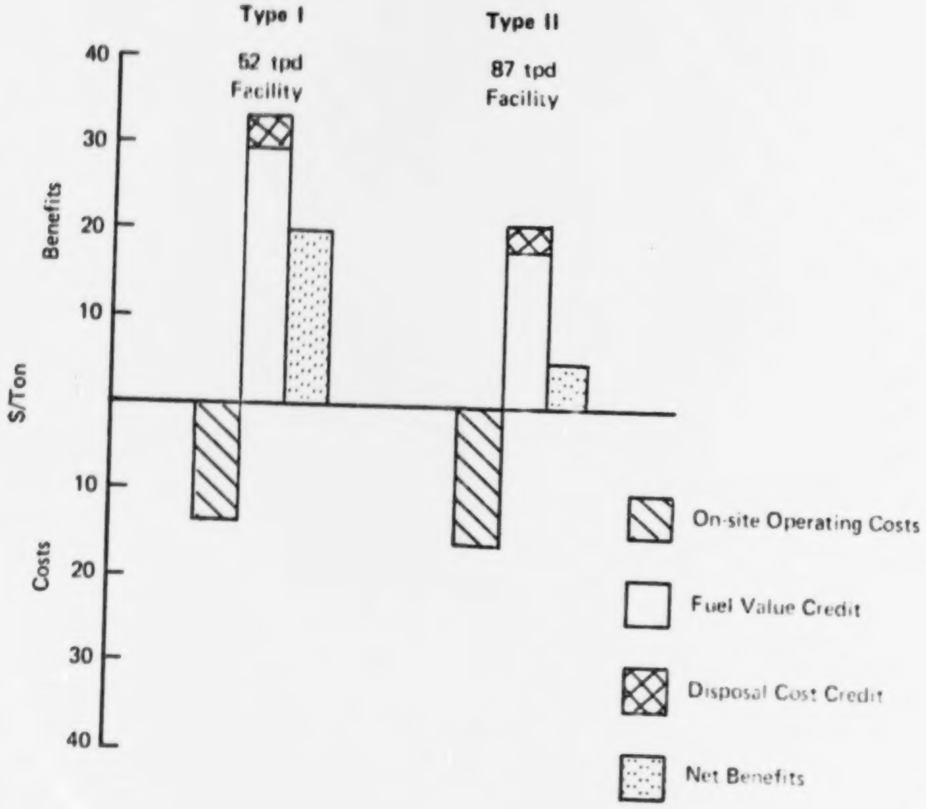
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1560446	16.12		16.12
Fac. and other fed. fac.				
Fac. and city				
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
948002	14.00	15.38	29.38

MARINE CORP DEVELOPMENT AND EDUCAT ON COMMAND



STATE: VIRGINIA

FACILITY Radford AAP

	I	II	III	
Maximum refuse rate at 50% firing	247	412	265	______ tpd

Available refuse from facility 2 tpd

from other fed. fac. 0.15 tpd

from city (Radford) 22.5 tpd

from county ______ tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	385248	94.25		94.25
Fac. and other fed. fac.	385687	88.11	1.00	89.11
Fac. and city	451038	13.43	1.00	14.43
County				

TYPE II

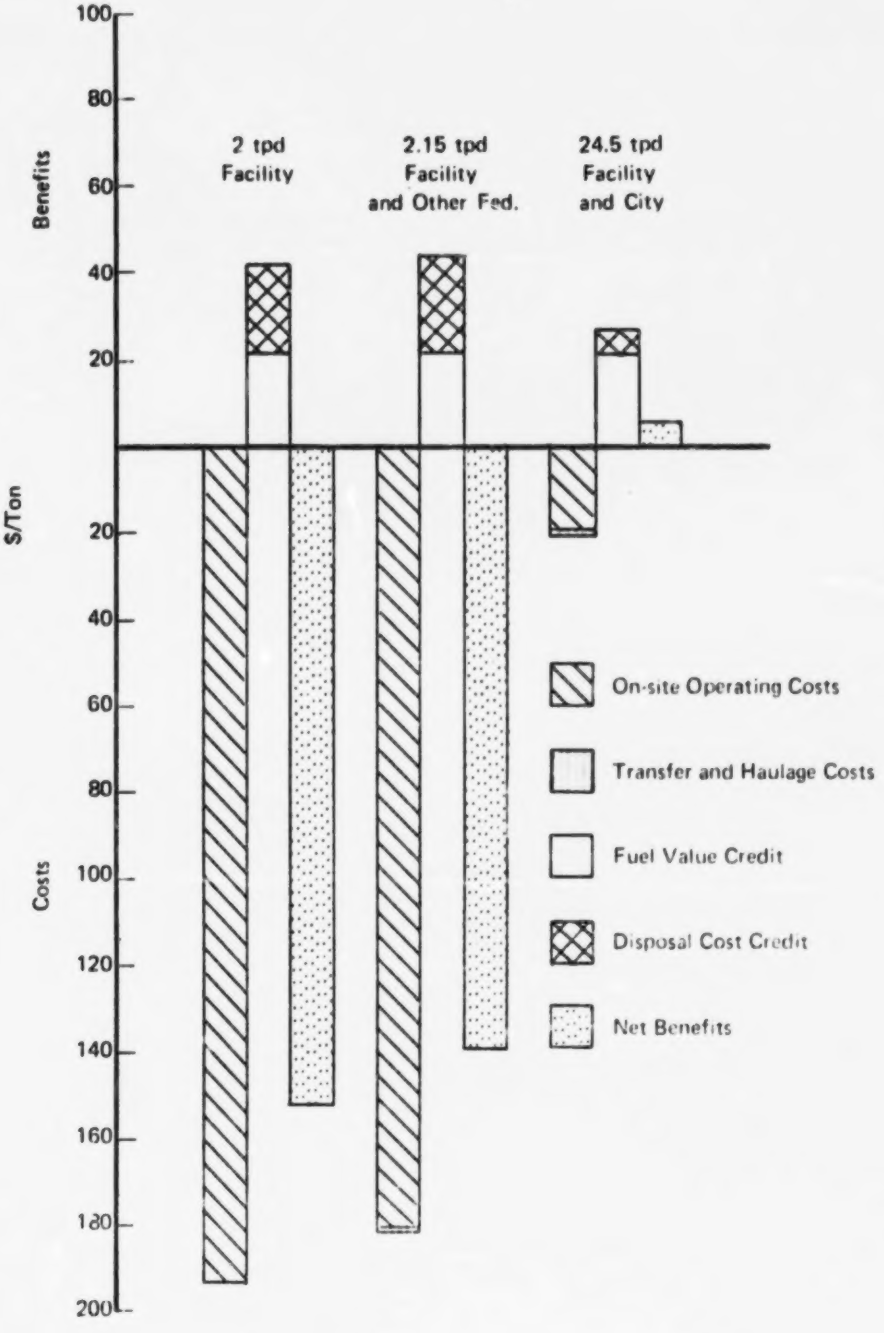
	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	826348	193.90		193.90
Fac. and other fed. fac.	826787	180.72	1.00	181.72
Fac. and city	892138	19.49	1.00	20.49
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
1116205	14.00	2.86	16.86

VIRGINIA

RADFORD ARMY AMMUNITION PLANT – TYPE II



STATE: Virginia

FACILITY Virginia Heating and Refrigeration Plant

	I	II	III	
Maximum refuse rate at 50% firing	85	142	91	tpd

Available refuse	from facility	.7	tpd
	from other fed. fac.	188.6	tpd
	from city	1814	tpd
	from SMSA	6410	tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	945303	629.55		629.55
Fac. and other fed. fac.	1191796	11.38	3.05	14.43
Fac. and city				
County				

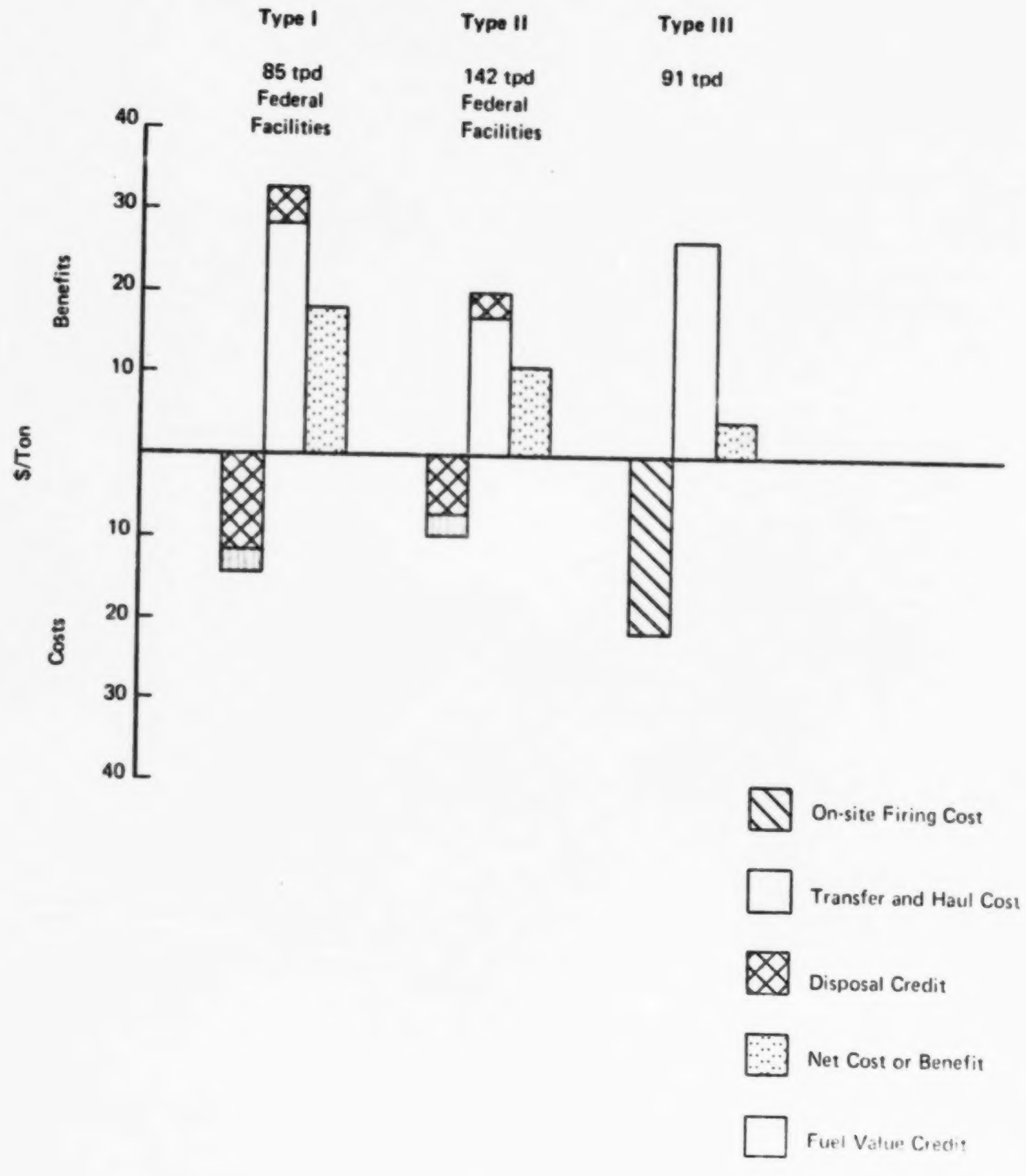
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1768292	1171.66		1171.66
Fac. and other fed. fac.	1957210	7.15	2.55	9.70
Fac. and city				
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
1128640	14.00	7.98	21.98

VIRGINIA HEATING AND REFRIGERATION PLANT



STATE: WASHINGTON

FACILITY Richland, Wash.-ERDA

	I	II	III	
Maximum refuse rate at 50% firing	82	136.5	88	______ tpd

Available refuse from facility 9 tpd

from other fed. fac. 0.4 tpd

from city (Richland) 59 tpd

from county ______ tpd

TYPE I

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1471717	80.49		80.49
Fac. and other fed. fac.	1472887	77.33	4.50	81.83
Fac. and city	1557975	13.35	5.00	22.35
County				

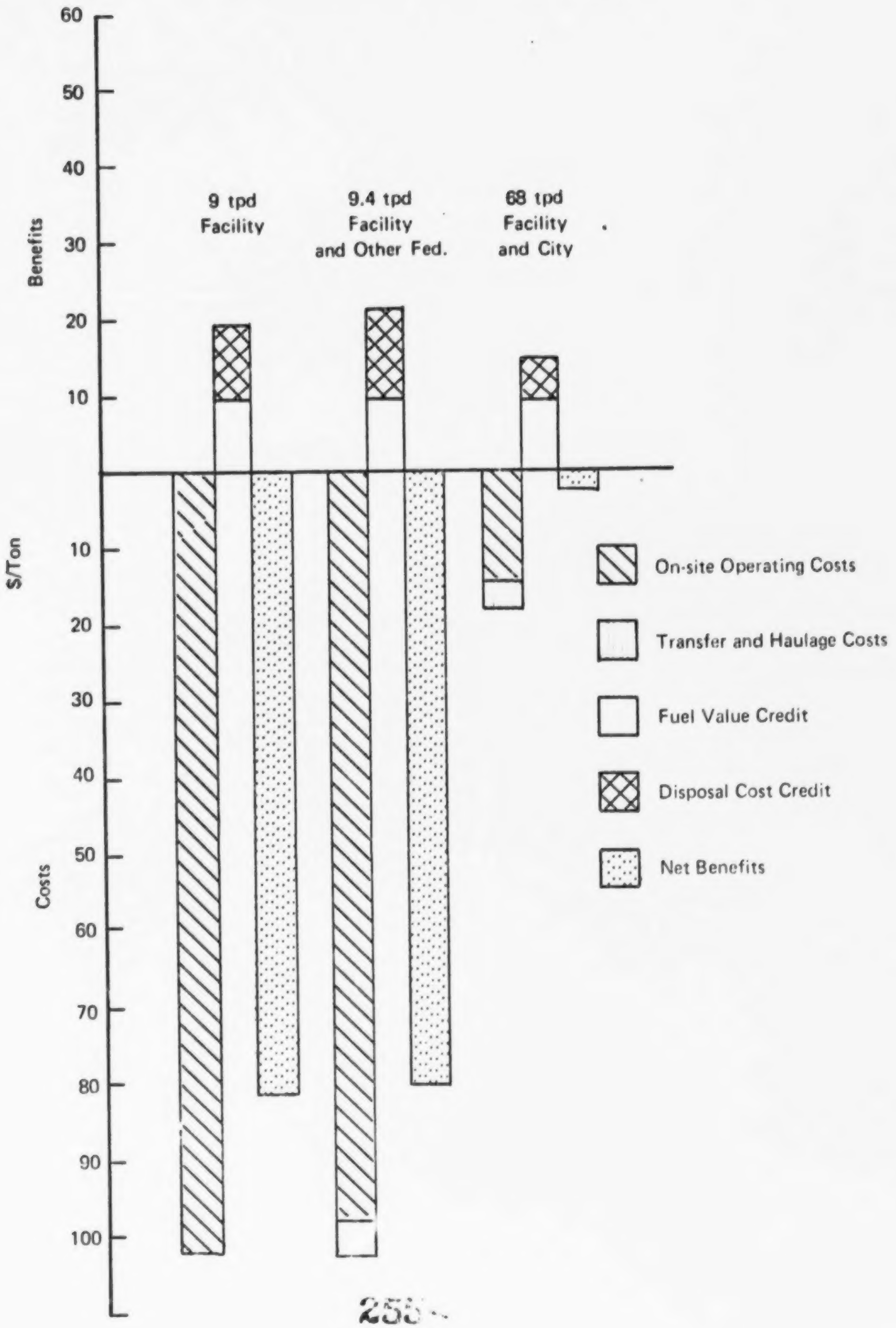
TYPE II

	Cap. Inv.	Op. Cost ($/ton fired)		
		on-site	t & h	total
Facility	1912817	101.85		101.85
Fac. and other fed. fac.	1913987	97.71	4.50	102.21
Fac. and city	2085333	14.27	3.20	17.47
County				

TYPE III

Cap. Inv.	Op. Cost ($/ton fired)		
	fuel	firing	total
1622013	14.00	16.45	30.45

ERDA–RICHLAND, WASHINGTON – TYPE II



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